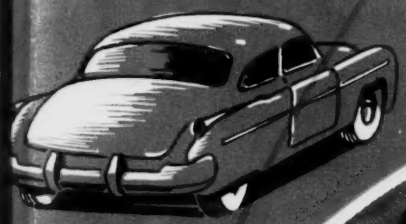
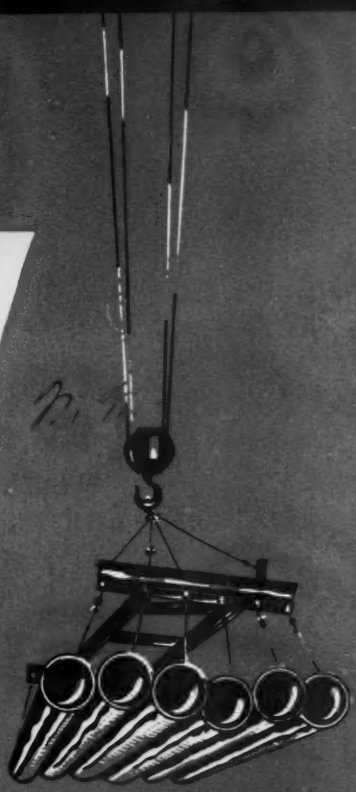
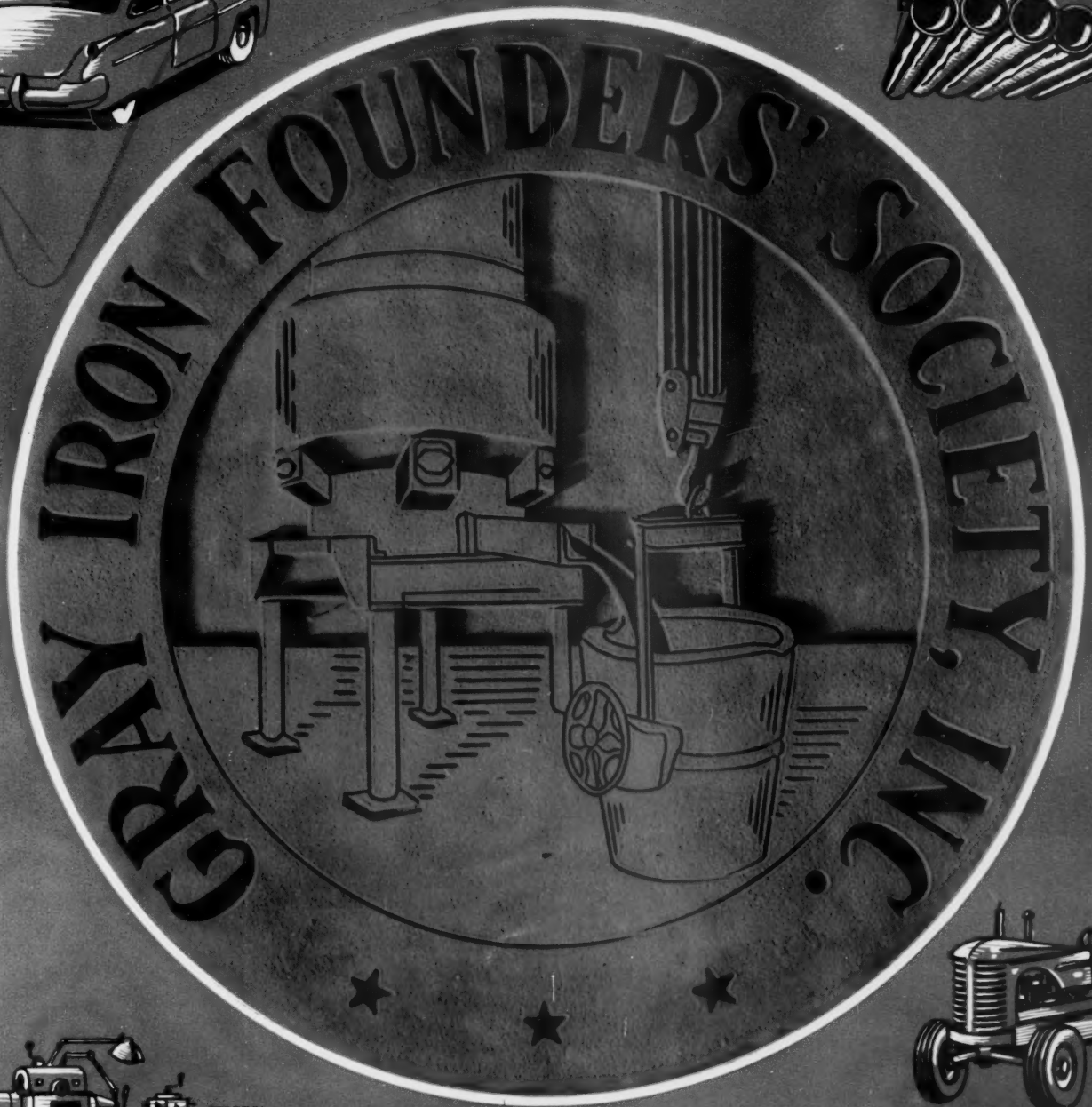
OCTOBER 1953

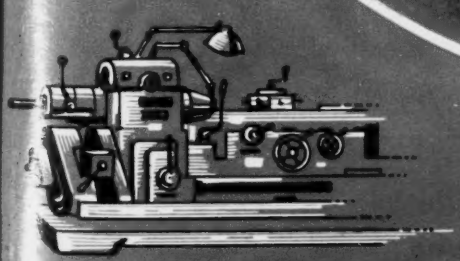
FOUNDRY

WHEREVER METALS ARE CAST



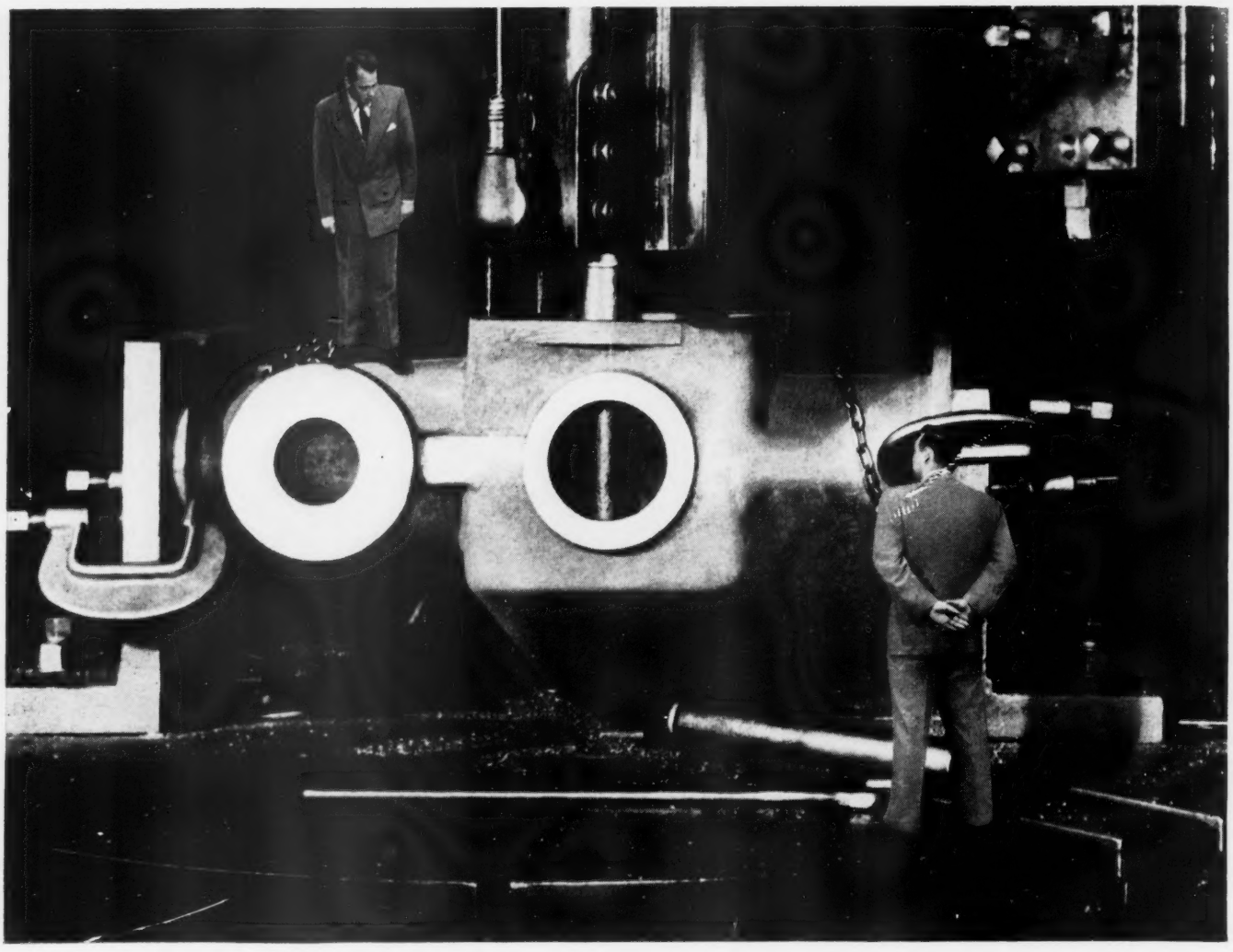






Twenty-fifth Anniversary

—see page 127



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NICKEL ALLOY IRONS develop improved properties

plus all the basic advantages of plain cast iron

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The matrix of nickel alloyed irons closely resembles the pearlitic matrix found in high carbon steels, whereas the matrix of ordinary plain iron resembles that found in low carbon steels. Compositions of nickel alloy irons can be adjusted to reduce "chill" in thin sections without risk of forming "spongy" regions in heavy sections. This promotes uniform strength, improved machinability, pressure tightness and wear resistance.

Hardness in nickel cast irons results from improvement of the matrix. Chilled areas and hard carbides, which impair machinability, are obviated. Nickel improves response to heat treating. In fact, use of nickel alone or with other alloying elements plays an important part in meeting a variety of requirements.

Accordingly . . . nickel alloyed irons permit production of castings with high levels of the following properties:

Strength

Tensile and transverse strengths of castings are greatly increased by the addition of nickel to cast irons of properly adjusted base mixture. The ratio of compressive strength to tensile strength is retained. Greater uniformity of strength in thick and thin sections is achieved.

Elasticity

The elastic modulus increases with strength. In this respect nickel-containing irons of the high strength type possess good stiffness and do not deform permanently under loads that would be damaging to irons of lower elastic modulus.

Damping Capacity

The damping capacity inherent in gray cast iron is not impaired by the presence of nickel.

Wear Resistance

The uniformly pearlitic matrix of nickel cast irons appreciably improves wear resistance. The uniformly fine graphite flake distribution, achieved in suitably processed irons *without formation of a poor wearing dendritic condition*, affords optimum resistance to wear and galling.

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Characterized by dense grain structure and fine dispersion of graphite throughout, nickel alloy irons are close-grained and offer an extraordinary degree of pressure tightness under high hydrostatic pressures, without sacrificing machinability.

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Heavy machinery frames and *beds* are typical of cast parts that benefit from the rigidity and good damping capacity of nickel cast irons. *Cylinder* and *pump liners, gears, dies, machine tool ways, saddles* and *tables* exemplify parts produced in nickel irons to assure greatly increased strength and wear resistance. And nickel alloyed iron is used for *heavy duty brake drums* to resist heat checking, thermal shock, wear and galling. The nickel cast irons are readily heat treated, and respond particularly well to flame and induction hardening.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering nickel cast irons for many end uses in defense and defense supporting industries.

F 1053

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So, for easy, efficient, economical sand control—change to the method of sand preparation already preferred by an overwhelming majority of iron foundries. We have a new bulletin with full details —write for your copy—TODAY!

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Produced by *Federal* at Crown Hill, West Virginia. *High* in volatile combustible material, low in sulphur and ash content—basic requirements for a top quality seacoal. Ground or granulated to properly match the sand used.

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Mined, processed and guaranteed by *Federal*. Unexcelled in uniformity and ability to develop green and dry strength. Possesses many times the natural bonding power of any other sand bond. Truly the best of the bentonites!

FEDERAL SAND STABILIZER

A processed cellulose sand additive whose high combustibility allows sand to expand evenly to eliminate casting defects. It increases sand flowability to provide better ramming conditions and attracts moisture to broaden the safe moisture range.

IMPORTANT . . . Federal Sand Stabilizer also holds lumpy shakeout to an absolute minimum!

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FOUNDRY

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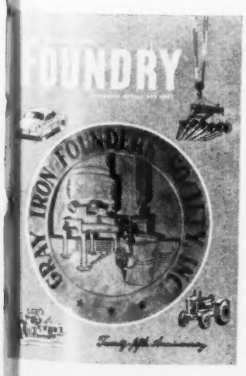

THE COVER: The Gray Iron Founders' Society emblem casting was produced by Sessions Foundry Co., Bristol, Conn. Anniversary story starts on page 126

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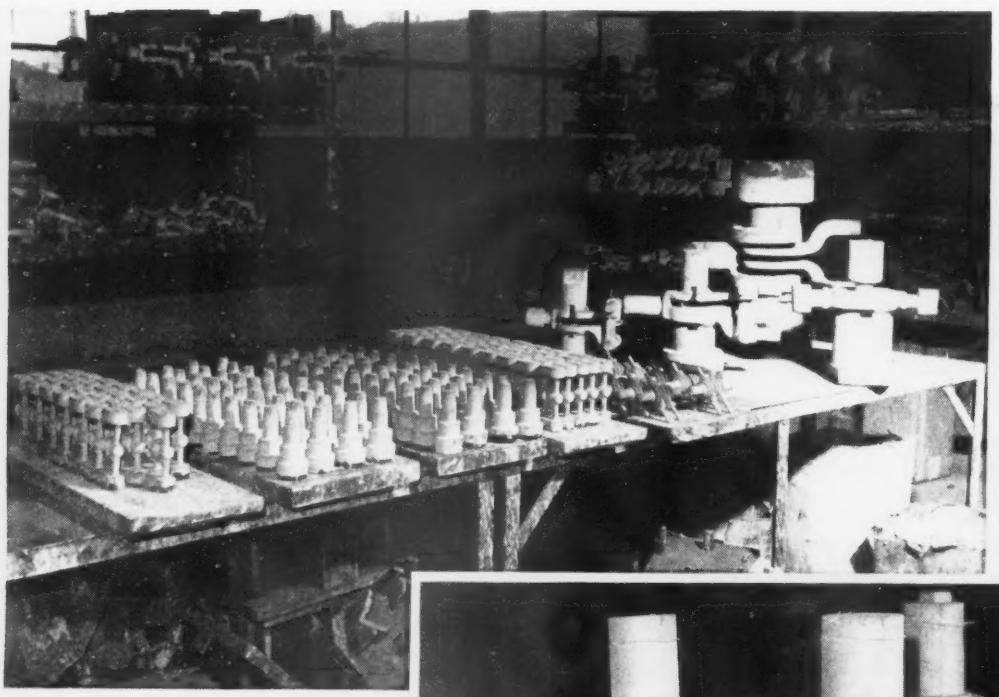
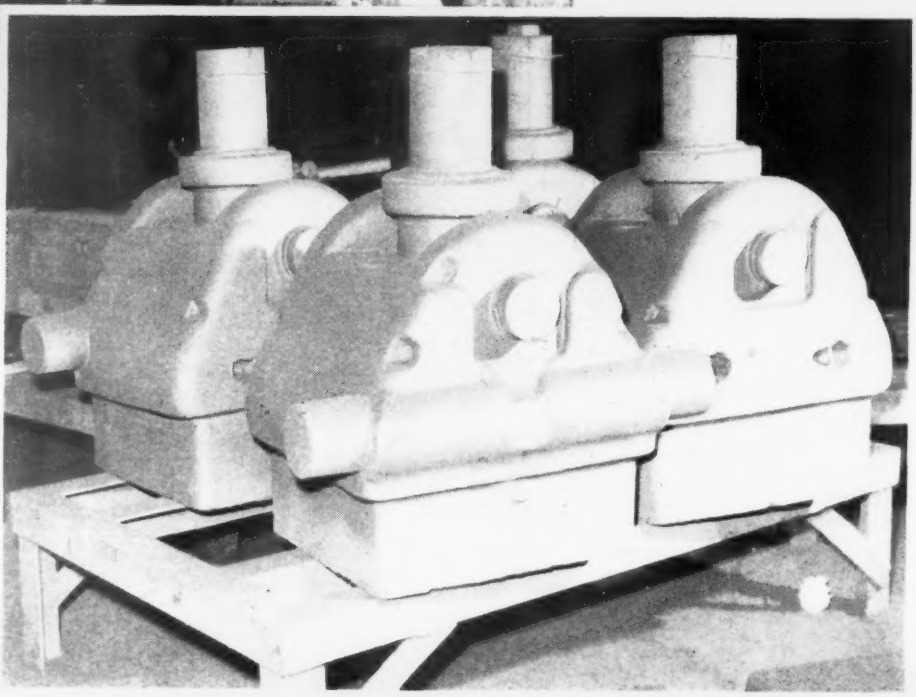
Parked "Model T's" date this early photograph of Atlas as it appeared at the outset of the roaring twenties. Seen at the extreme left background is the familiar stack of LINOIL drums.

Gone are the quaint "Model T's". In their place . . . in front of the modern, revamped Atlas foundry . . . stands the evidence of progress in the automotive field, an industry to which Atlas has made numerous contributions in the form of quality castings.



small, medium and large cor ...all made with LINOIL



Small delicate cores ready to be set in mold along with intricate assembled cores for hydraulic pump castings of varying sizes.

Housing cores for castings used in military equipment.

LINOIL endurance...

good insurance...

for quality cores

or a generation, a running inventory
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30,000 TONS OF MALLEABLE IRON are annealed annually in these two rows of G-E bell-type electric furnaces at National Malleable and Steel Castings Company. Of sturdy, compact structure, G-E furnaces assure years of dependable service while conserving floor space. Cleanliness of installation improves working conditions and contributes to high output.

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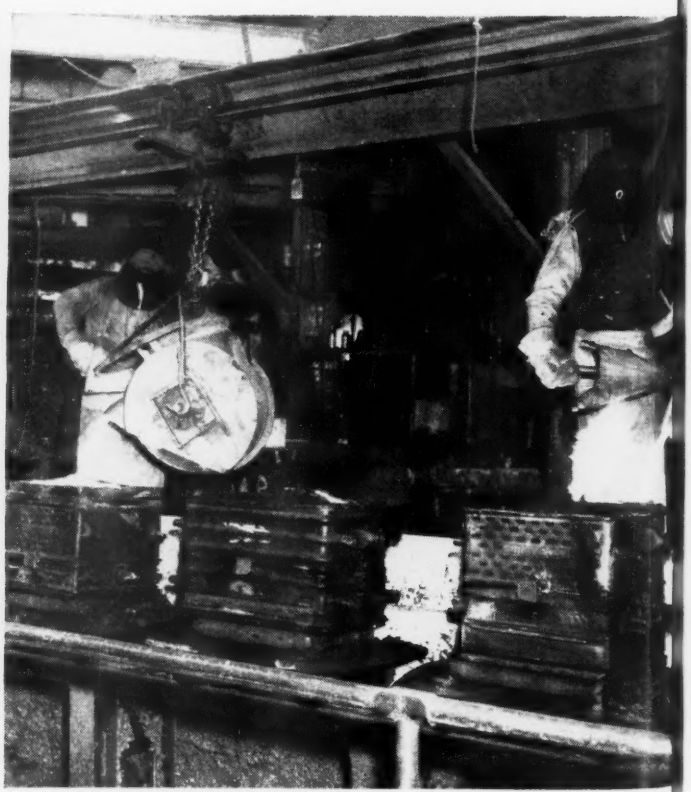
PROPER CONTROL AND TIMING of annealing cycle for all 25 G-E furnaces is provided by a G-E control unit for each row of furnaces. Easily readable dials simplify control operation.



MODERN POURING PRACTICES and skilled operators play an important part in National's efficient annealing operations. Here, small castings are poured on an assembly-line basis.

(Advertisement)

MECHANIZED LOADING AND UNLOADING of malleable castings are handled by two double-ended G-E gantry cranes. Specially designed for National's annealing operation, this equipment allows one operator to load, unload, quench, and place on transfer cars a six-ton charge of castings. Castings above are being transferred to air quench shown at lower right.

Cut 67% with G-E Heating "Package"!

World's Largest Independent Producer of Malleable-Iron Castings Replaces Old Periodic Furnaces with Modern G-E Annealing Equipment

By changing to G-E electric furnaces for annealing malleable iron, National Malleable and Steel Castings Co., Cleveland, Ohio, has reduced their annealing cycle from 144 hours to 48 hours and cut man-hours 50%!

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National Gets Valuable Engineering Services

Comprehensive engineering service by G-E heating specialists before, during, and after furnace installation influenced National to buy G.E. Because G.E.'s field staff of service engineers is unmatched both in size and experience, National knows they will be able to keep their equipment producing profitably. In addition to this, National has found it saves time and money to plan their annealing installation with a single manufacturer.

To learn how you can get fast, high-quality annealing at low cost, contact your nearest Apparatus Sales Office and ask for the services of a G-E heating specialist. And for a description of G-E malleable-foundry furnaces in action, write for Bulletin GEA-5797 to General Electric Co., Section 720-109, Schenectady 5, N. Y.

You can put your confidence in—

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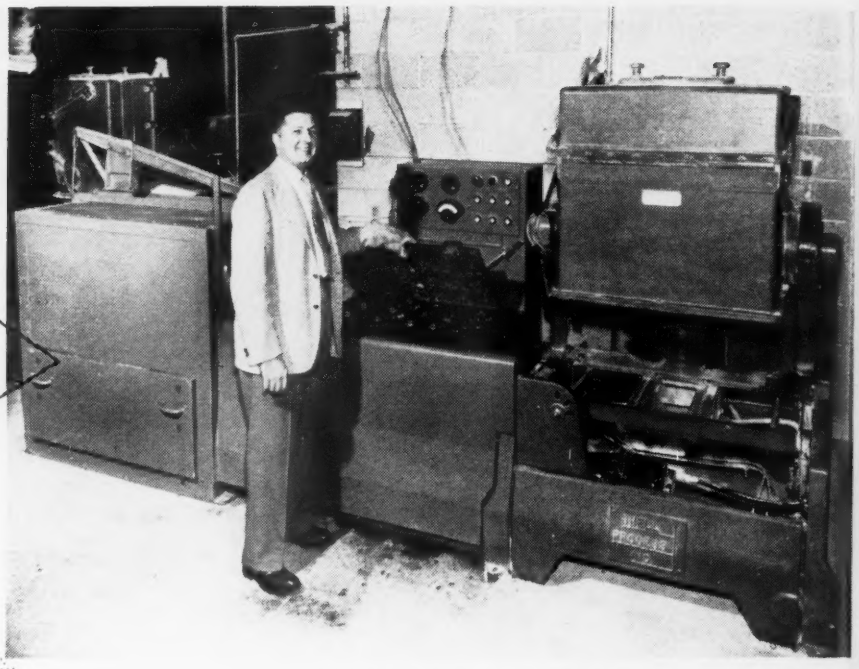

President Earl W. Jahn of Shell Process, Inc., Chicopee, Mass., at the control panel of their new fully automatic shell molding machine. The long vertical drop of sand-resin mix in this machine produces dense, 20" x 30" shells from intricate deep draw patterns. Metered oil pressure enables the ejection cylinder to strip shells smoothly without breakage. Interchangeable pattern carriages plus a special preheating oven chamber eliminates downtime between job changeovers.

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Assure uninterrupted production of consistently accurate shell molds by specifying Dow Corning 8 Emulsion as your parting agent. Developed especially for shell molding, this new silicone costs less, goes further, and reduces buildup to a minimum.

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Dow Corning 8 Emulsion can easily be diluted with hard or soft water. Nonflammable and non-corrosive, it is available at a new low price, 8% below that of previous emulsions. For more information and a free trial sample, fill in and mail this coupon today.

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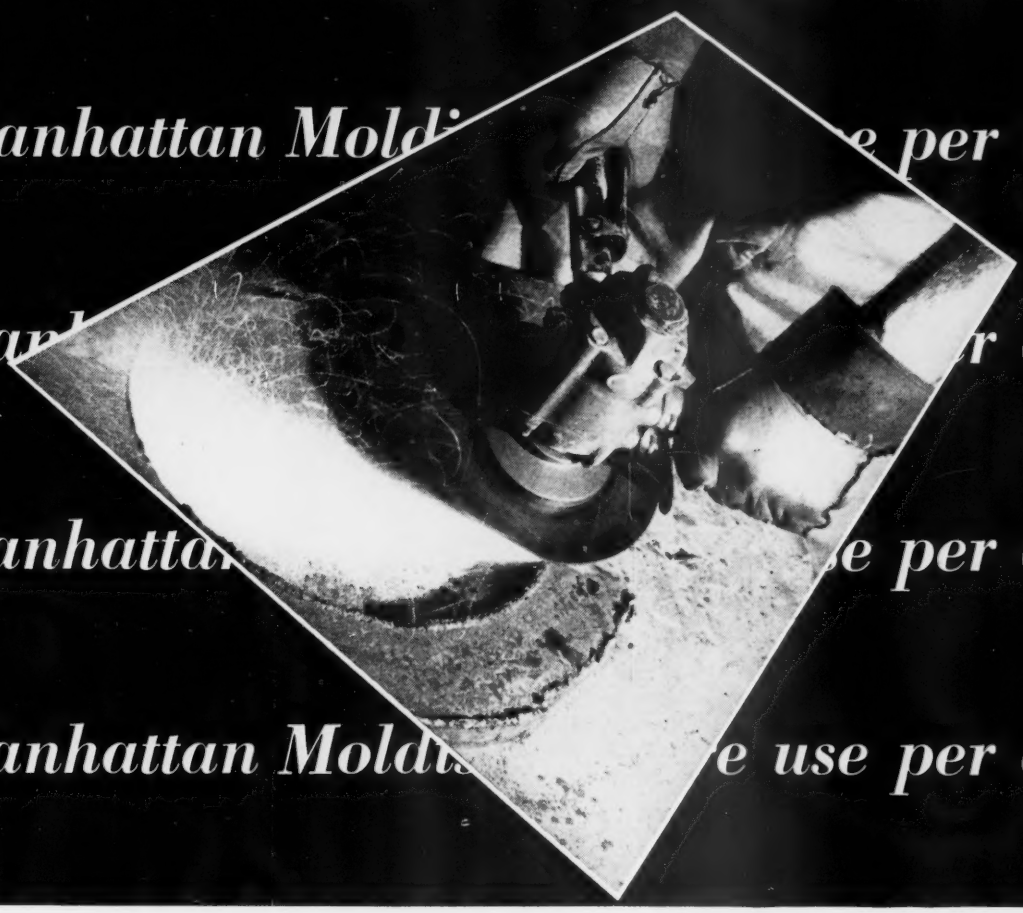

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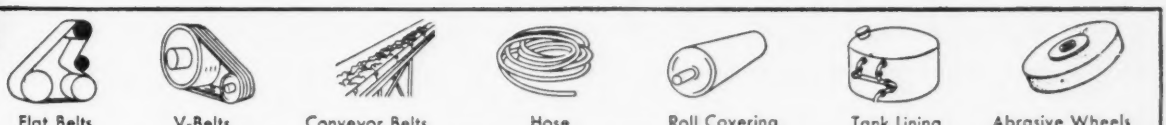

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This belt ran over 2 years at 500° F.

Imperial Sahara Belts are unsurpassed for handling hot materials

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Such service records are not unusual for Imperial's Sahara Belting. If you use belting to handle high-temperature materials, it will pay you to let our engineers submit their recommendations on new installations or replacements. Imperial Belting always costs less to use because it's engineered specifically for the job to be done.

Made of heavy-duty tight woven duck, with special impregnation and insulation, *Standard Sahara* handled materials up to 300° F.; *Insulated Sahara*, up to 450° F.; *Super Insulated Sahara*, up to 600° F. Imperial's inner-locked stitching positively prevents ply separation. Write for Data Sheet 47-8 and price list.

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Engineered Belting—
The Right Belt for Each Job

With the Editors

THERE WAS RELIEF: Once again the demand for copy has caught up with me on vacation. This is being written early in September on the shore of Lake Gentian at Wing Haven, located 5 miles north of Angola, Ind. The day is perfect, with clouds dotting the blue sky, and a cool breeze that whispers of fall. It was only yesterday that a gentle rain broke the extended heat wave, washed the dust from the trees and bushes along the roads and paths, and revived the vegetation that had almost dried up. The relief that came with yesterday's rain and today's north breeze will long be remembered.

—o—

Tragedy: Yesterday's relief was marred by nearby tragedy. Shortly after noon, the rear trailer on a two-trailer truck, which was loaded with rolls of sheet steel, broke loose on a hill just beyond this resort on U. S. 27, smashed into a passenger car traveling in the opposite direction, scattered steel all over the road, and wrecked things in general. The five innocent passengers in the car were quite badly injured and a five-year-old boy died this morning.

I have seen four bad truck accidents this summer and have come to the conclusion that stringent regulation of both truck equipment and operation is needed if the highway death toll due to trucks is to be reduced. On numerous occasions I have stood out in front of this place and watched the trucks bowl down one hill in order to make the next one in high and have realized that the driver had little control over the vehicle if an emergency arose. Yesterday I examined the coupling and found it a rather crude affair that looked more like some of the railroad equipment of the gay nineties than something modern. There were no adequate safety devices to protect this coupling, and it does seem that truckers should be compelled to have safe equipment or else be forced off the road. I think it is about time for this nation to let the truck owners and operators know that they do not own our public highways.

—o—

Looking Back: Several historical booklets prove quite interesting. One, which should have been mentioned earlier, was published late last year by the Frick Co., Waynesboro, Pa., in celebration of a century of engineering service. In 1852, an advertisement in the Waynesboro "Village Record" announced that G. & J. D. Frick had opened a new machine shop and foundry about ¼-mile west of Ridgeville, Washington county, Md. The company manufactured steam engines, boilers, pumps, lathes, cook stoves and patterns for all kinds of castings. The plant was moved to Waynesboro shortly before the Civil war. The company is to be complimented on this booklet, which presents the high points in the history of the organization through photographs, drawings and a small amount of text.

Seventy-five years of electrical progress is pictured in a "Scrapbook History" recently published by the General Electric Co. Starting with a reproduction of the newspaper announcement of the invention of the incandescent lamp by Thomas A. Edison, the contributions of other great names in the electrical field are shown with reproductions of many old photographs and drawings. This scrapbook surely proves that tremendous progress has been made in the electrical field since 1878.

—o—

Why Stop at Four?: Pat Dwyer has had a note from Francis D. Roper of the National Foundry Craft, West Bromwich, England, telling how he came about making the cup, saucer, and four spoons described on page 96 of the September issue. It seems that the *Lincolnshire Echo* carried the following item one day in March 1953.

Molding Marvel

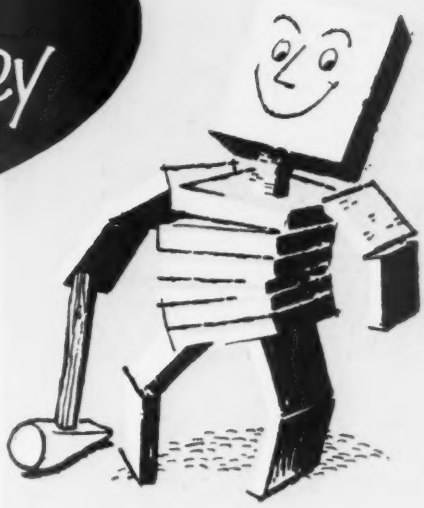
About a year ago a Lincoln craftsman molded a cup and saucer containing a spoon, all in one piece. Expert molders at Robey's works thought it could not be bettered, but Mr. Harold Smith, a foreman molder of 128 Ripon Street thought otherwise. To prove it he went home and molded, in about seven hours, a beautiful cup and saucer with a spoon in each! The whole thing is regarded as a marvelous feat even by molding experts.

Mr. Smith, who has been a molder since he was 15 years old, has made sets with one spoon before, but this was the first time he had tried making one with two spoons. As a pattern he had the cup, saucer and spoon he uses for meals at home. He is anxious to keep technical details much to himself but he told me that the metal was "babbitt" metal—which is used for bearings.

Mr. Roper evidently took up the challenge, because on Apr. 6, 1953, the following item appeared in that paper:

(*Concluded on page* 12)

Two handy helpers that save time and money



H-W PLASTIC FIREBRICK
is made in standard and super classes. Slabs two inches thick are packed in cartons ready to apply by ramming.

HARBISON-WALKER Plastic Fire Brick and Castable Refractories

These versatile refractory products can be used for a multitude of important jobs around your furnaces and boilers—from the construction of a complete monolithic lining, to patching a roof, wall or hearth. Harbison-Walker Plastic and Castable Refractories are made in all the various classes, are easy to prepare and apply, and are readily available from nearby stocks.

H-W CASTABLE REFRACTORIES
may be used like concrete or applied by gun placement methods. They are made in eight classes, for every kind of service. Shipped dry, ready for mixing with water.

Send for information

BULLETIN EB-11

Complete data on all grades of Harbison-Walker Plastic Fire Brick and Castable Refractories are given in Bulletin EB-11.

HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES
World's Largest Producer of Refractories
General Offices: **PITTSBURGH 22, PENNA.**

"S.F.P.M." means something else too!

SIMONDS ABRASIVE CO.
Grinding Wheels

As you know, the letters "s.f.p.m." stand for surface feet per minute. For you, "S.F.P.M." can also mean "Simonds for production maximum" with Simonds Resinoid and Vitrified bonded grinding wheels. And this is proven productivity . . . consistently shown in field surveys of industrial plants where Simonds wheels are used. Put these proven producers to work on your high speed and low speed grinding jobs. They're part of Simonds' complete line including grinding wheels, mounted wheels and points, segments and abrasive grain . . . all accurately specified to meet your job needs exactly.

Write for data book and name of your Simonds Distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y. Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(*Concluded from page* 10)

Not So Wonderful, He Says!

Remember my note about a Lincoln molder who had cast a cup and saucer and two spoons all in one piece? Well, I have received a letter from Mr. Francis D. Roper, instructor at the National Foundry Craft Training Center at West Bromwich enclosing a photograph of a cup and saucer with *four spoons,* which he tells me he cast in less than two hours! He had been shown the paragraph and illustration by a pupil, John Edwards, an apprentice molder from Ruston & Hornsby Ltd. of the cup and saucer cast by Mr. Harold Smith of 126 Ripon Street. John Edwards is taking a training course at West Bromwich and was anxious to know how Mr. Smith had produced his "molding marvel."

Mr. Roper does not regard even his own feat as anything out of the ordinary and says, "It is really very easy when you know how," —but doesn't explain the secret! The metal which he used is an aluminum alloy known in the trade as DTD424, which is in every day use in many aluminum foundries. I now wait patiently for news of the casting of a tea service and canteen of cutlery.

Where is this going to end?

—o—

Fishing: Whenever the opportunity presents, I thoroughly enjoy getting out on the lake for a bit of fishing. Up to now I have not fallen for the fancy tackle, but confine much of the activity to the use of a bamboo pole and line. Much of the vacation was spent in that manner, and I did get a fair catch of blue gills and bass. With this interest in fishing, I was especially intrigued by the following item in the Aug. 6, 1953 issue of *The Foundry Trade Journal*, London:

FOUNDRYMEN ANGLERS

Twenty-eight members of the Allied Ironfounders' Social and Sports Club (Angling Section) travelled by special bus to fish the fifth competition for the Hill Cup, permission having been received to fish a two-mile stretch of private water on the River Tummel at Ballinluig. The prize-winner was J. Bennett, of Falkirk Iron Company Limited, with five trout weighing 3.7 lb., the heaviest being 1 lb. 14 oz.

A special prize was donated by J. Don for the heaviest fish caught by a competitor not in the official prize-list. It was won by G. Craig, of Callendar Abbots, with a grilse weighing 2 lb. The Hill Cup aggregate, after five competitions is now: J. Bennett, 8 lb. 15 oz.; F. Charleston (Abbots), 6 lb 12 oz; M. Reif (Falkirk Iron), 3 lb 3 oz. Arrangements were completed during the journey to fish the sixth and final competition for the Hill Cup on Loch Rannoch and Tummel later this month.

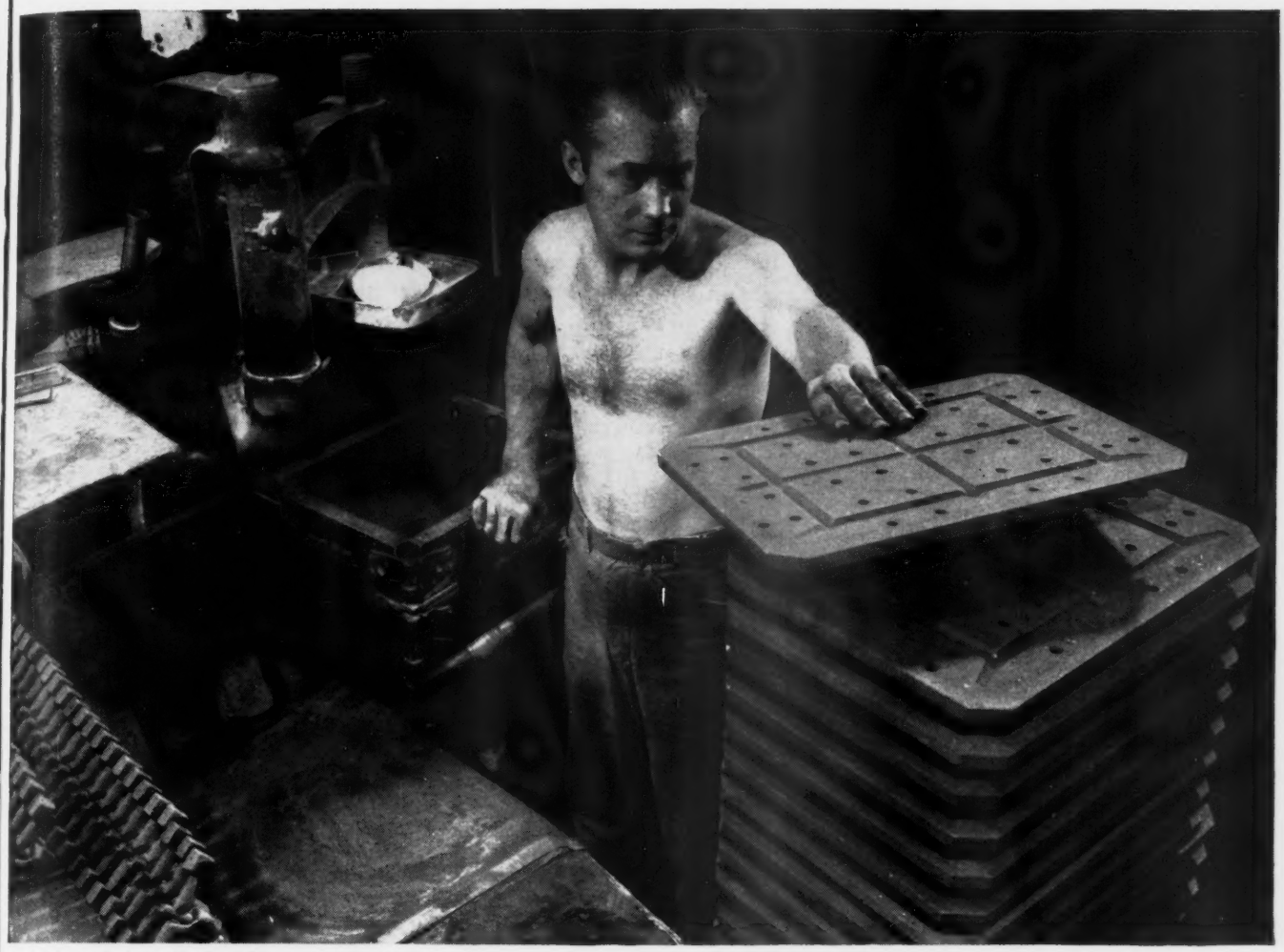
—o—

Reprint: We have copies of the Special Report on Foundry Industry Progress in 40-page reprint form which we will be glad to send to readers requesting single copies. This is the readable report which appeared as a special feature of our recent May Pre-Convention issue. It describes the technical and operating advances of the industry in recent years and discusses future trends.

—o—

Be Seeing You: This is the season of foundry meetings. Annual meetings, regionals, technical meetings, chapter gatherings, etc., surely fill the calendar. The editors have a heavy travel schedule "covering" these affairs, so you may be seeing one of us now and then. We will be looking forward to seeing you.

F.G.S.



Molder at Louis Meskan Brass Foundry lifts Edco Dowmetal Bottom Board one-handed.

Notice how its bridge-type construction makes an Edco Board easy to handle, as well as providing resistance to warping and breaking.

"Our EDCO Dowmetal Bottom Boards have paid for themselves in one year...."

says EMMETT TORKELSON, Foundry Superintendent
LOUIS MESKAN BRASS FOUNDRY, INC., CHICAGO, ILLINOIS

"Every one of the 300 Edco Dowmetal Bottom Boards we bought a year ago is still in daily use," says Foundry Superintendent Torkelson. "Further," he says, "our Edco Boards have reduced our scrap loss by helping produce castings true to pattern.

"Edco Dowmetal Bottom Boards are easier to work with. Their design enabies the molder to roll the flask with greater ease than is possible with wood boards.

"We figure our Edco Dowmetal Bottom Boards have paid for themselves in one year. This is based on elimination of board repair and replacement, plus scrap savings, since switching from wood boards."

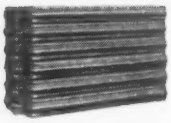
Louis Meskan Brass Foundry, Inc., is a medium-size foundry, casting nonferrous metals, including brass, bronze, copper and lead as well as aluminum.

Whether your foundry is large, medium or small . . . whether you cast iron, steel or nonferrous metals . . . you will find it worth your while to look into Edco Dowmetal Bottom Boards. It's easy to get more information:

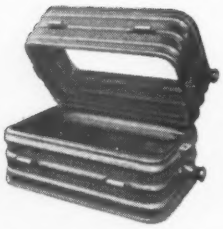
Simply write a letter or phone MAnsfield 6-7330 and we'll send you a price schedule and list of 83 standard sizes available from stock.

CHRISTIANSEN CORPORATION

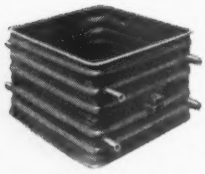
210 SOUTH MARION STREET
OAK PARK 1, ILLINOIS
ALUMINUM ALLOY INGOTS
MAGNESIUM ALLOY INGOTS



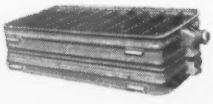
Model OM-2



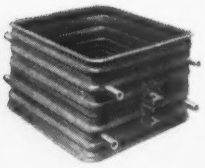
Model CH-20



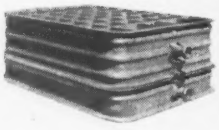
Model TM-10



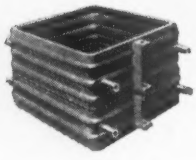
Model CH-30



Model TM-11



Model CH-40



Model TM-12

Republic Steel Foundry Flasks

Each Republic Flask is designed and built to meet the needs of the individual job . . . built to give long and economical performance.

Republic Flasks feature these advantages to help speed production in your plant: flask walls are of proper thickness . . . flanges are correctly placed . . . ribs and flanges extend full depth around the entire flask . . . every cope, drag and check is one integral piece of tough steel . . . there are no built-up sections to jar loose.

Write for illustrated literature on the complete line of Republic Steel Foundry Flasks.

now... specify *Republic*

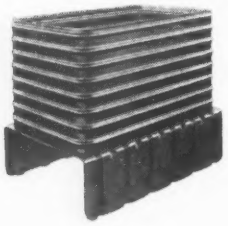
STEEL FOUNDRY FLASKS
STEEL BOXES and SKIDS

Republic Steel Boxes and Skids

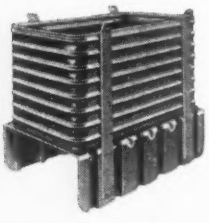
Preferred throughout industry, Republic Steel Boxes and Skid Platforms help speed movement of materials . . . simplify storage of materials... produce savings in all phases of materials handling.

Republic Steel Boxes and Skids are fabricated from heavy gauge steel sheets. They feature deep reinforcing ribs, designed to give maximum strength and rigidity. Manufactured in a wide range of sizes, Republic Boxes and Skids are available for use with trucks, crane or hand-operated units.

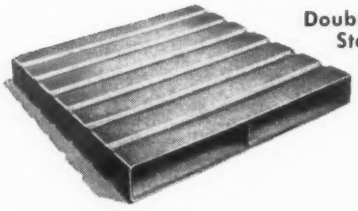
Specify "Republic" when you want the best in Steel Boxes and Skids. Write for illustrated catalog describing the complete line.



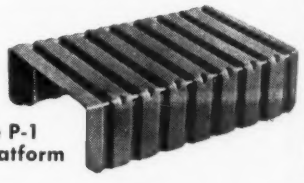
Type PB-120



Type PB-120-L

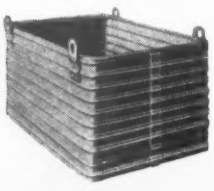


Double-face Steel Pallet



Type P-1 Skid Platform

Type B-80C

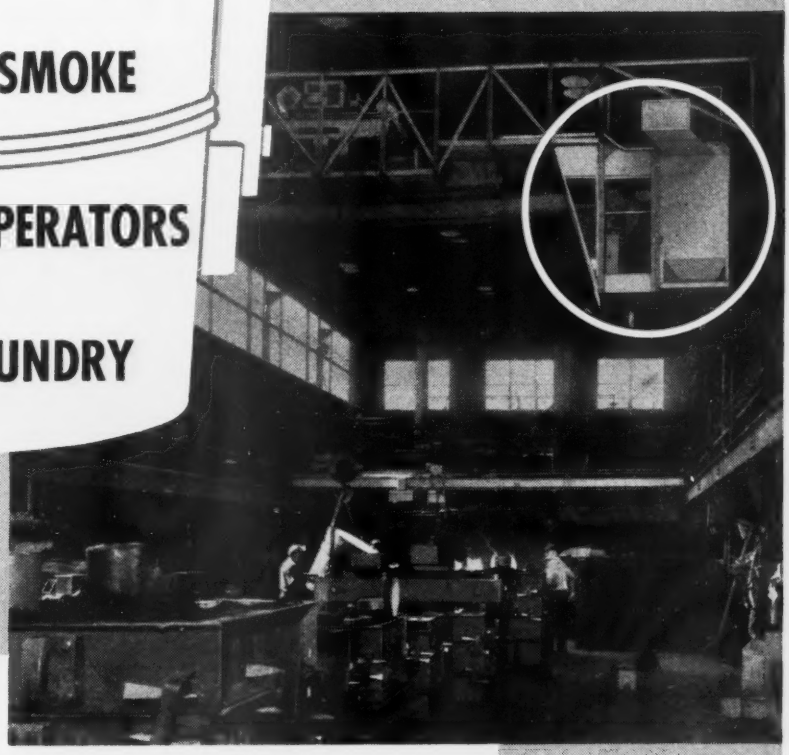


REPUBLIC STEEL

PRESSED STEEL DIVISION
REPUBLIC STEEL CORPORATION
6208 TRUSCON AVENUE • CLEVELAND 27, OHIO

DRAVO CONDITIONERS ELIMINATE FUMES AND SMOKE

FOR CRANE OPERATORS AT GREENLEE BROTHERS FOUNDRY



Operations in the foundry at Greenlee Brothers & Company had been hampered by excessive smoke and fumes. Smoke, which resulted from burning of residual oil and flour, and fumes from core ovens made it impossible for crane operators to work at maximum efficiency. Installation of Dravo Crane Cab Conditioners eliminated these intolerable conditions, greatly improving the efficiency and alertness of crane operators while safe-guarding their health.

Dravo Crane Cab Conditioners are ruggedly-constructed ventilating units, fabricated specifically for rough industrial usage and are especially designed for conditions which require fume removal. These units provide a continuous supply of air from which dust and dirt has been removed. Electric strip heaters maintain temperatures of 68° to 72° F. in crane cabs during winter months.

These units can be easily installed vertically, horizontally, or at any angle which space permits. A separate control cabinet allows on-off operations and regulates heat. Dravo Crane Cab Conditioners are also ideal for installation on mobile cranes, pulpits and other equipment operating where similar conditions exist.

Only Dravo has a complete line of crane cab coolers and conditioners. All units are available now! Write or phone your nearest Dravo office today for more information and have our representative call on you. Ask for Bulletin No. PS-130

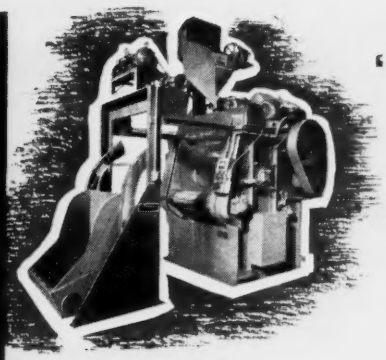
DRAVO

DRAVO
CORPORATION
Dravo Building, Fifth and Liberty Avenues
Pittsburgh 22, Pa.
ATLANTA . BOSTON . CHICAGO
CINCINNATI . CLEVELAND . DETROIT
INDIANAPOLIS . NEW YORK . PHILADELPHIA
ST. LOUIS . WASHINGTON

PANGBORN BLA
CUTS LABOR C

BOTH AGREE: Foundry Superintendent Arnold Salg and Foreman Leroy Patterson agree: "The kind of cleaning we get with the new Blastmaster fits right in with our ideas on quality—and quality is mighty important here at Gisholt!"

ATMASTER BARREL
CSTS 33⅓%



"Doing a quality cleaning job" for Gisholt Machine Co.

When the Gisholt Machine Co., Madison, Wis. installed a Pangborn Blastmaster ROTOBLAST® Barrel, Gisholt's primary concern was quality. On that score, the Blastmaster came through with flying colors.

But in addition to the fine cleaning job it does, Pangborn Blastmaster has slashed labor costs 33⅓%! And, as if this tremendous saving weren't enough, electrical costs have dropped way down. The Blastmaster uses only 23 H.P. as compared with 54 H.P. originally required—and the Blastmaster cleans faster, so the power consumption is less. What's more, the compact design of the Barrel frees over 200 sq. ft. of floor space required by former cleaning equipment.

The operation of the Blastmaster at Gisholt is typical of Blastmaster installations all over the country. If *you* are interested in better, faster cleaning . . . in *cheaper* cleaning . . . it will pay you to investigate the Pangborn Blastmaster Barrel. Available in 4 sizes—3, 6, 12, or 18 cu. ft. capacities. For more details, write for Bulletin 223 to: PANGBORN CORP., 140 Pangborn Blvd., Hagerstown, Maryland.

OVER 28,000 PANGBORN MACHINES SERVING INDUSTRY

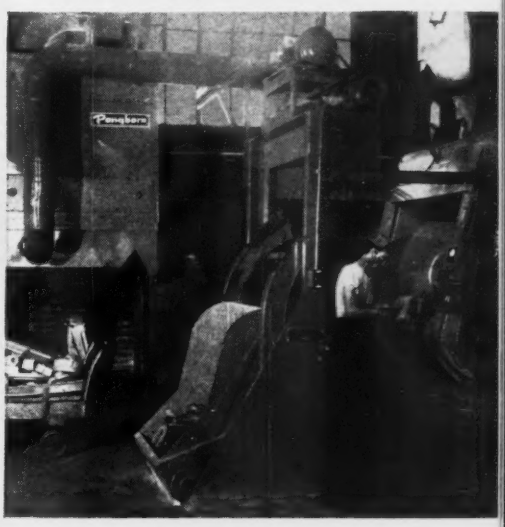
Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

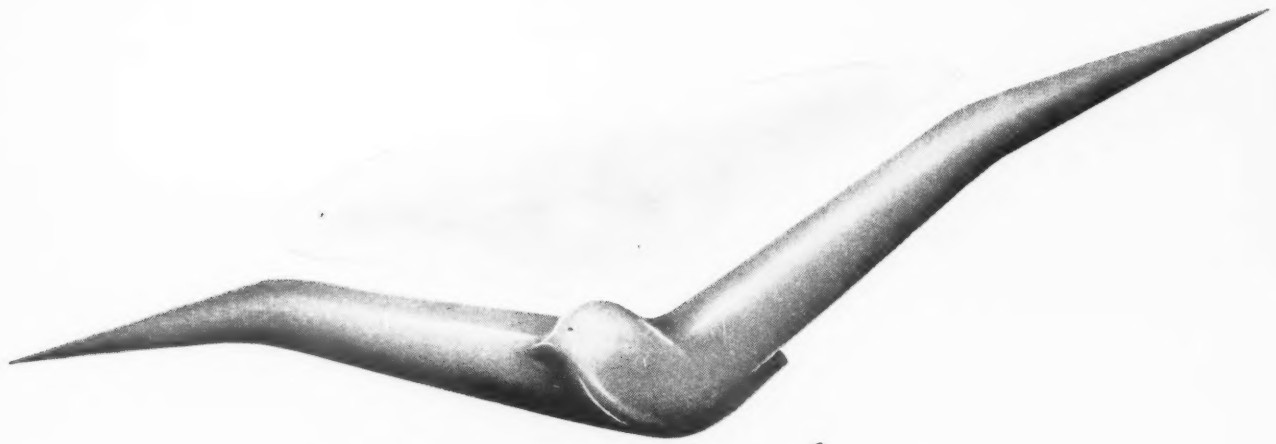
Blastmaster's convenient push-button panel eliminates many of the time-consuming steps in the cleaning operation.



Side view of Blastmaster shows simple, automatic loader. Pangborn Dust Collector in background serves the blast barrel.

Close-up shows the operator Peter Scallasi reversing work conveyor for easy unloading of cleaned castings.

Delta Mudding and Patching Compounds are used to eliminate fins at core joints and to repair core imperfections. They are easy to apply . . . quickly . . . uniformly . . . smoothly. Due to their high hot and dry strength characteristics they form a complete bond which eliminates the danger of gas leakage at core joints.



Smooth . .

NEW . . . IMPROVED . . . DELTA MUDDING & PATCHING COMPOUNDS

The new DELTA Mudding and Patching Compounds are faster, smoother and extremely easy to use. They are non-reactive with molten metal, will not expand or contract when dried, are highly refractory and have a high fusion point.

DELTA SLIKTITE — is a clean, smooth, ready to use plastic-type Mudding and Patching Compound for use on cores in the production of steel, gray iron, malleable and non-ferrous castings.

DELTA EBONY — is a smooth, black, ready to use plastic-type Mudding and Patching Compound for use on cores in the production of gray iron, malleable and non-ferrous castings.

Ask for working samples of the new, improved Delta Mudding and Patching Compounds. Be sure to specify SLIKTITE or EBONY. You will also receive complete instructions for use.

DELTA

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

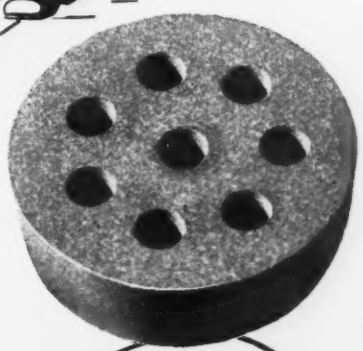
WHAT DO YOU FIND *after the* SHAKEOUT?

INCLUSIONS?

DIRTY METAL?

SHRINK HOLES?

OTHER DEFECTS?



If your foundry is using shop-made sand cores, you're taking an unnecessary and expensive gamble every time you pour. More and more foundries are discovering they don't need to take chances with shop-made cores. You can slash rejects losses, produce cleaner castings, and reduce machining time, *at less cost per core*, with

ALSIMAG CERAMIC STRAINER CORES

- Resistant to heat shock
- No erosion at normal pouring temperatures
- Non-spalling
- Completely free of gas
- Not affected by moisture
- Strong, will not break in handling
- Do not contaminate scrap
- Flat and uniform

USE

ALSIMAG® *Ceramic* STRAINER CORES

TEST THEM IN YOUR OWN FOUNDRY

Try AlSiMag strainer cores—let your own experience tell the story. Test samples of standard sizes free on request. Samples made to your specifications at moderate cost. Write today.

Write Dept.—D

AMERICAN LAVA CORPORATION

A SUBSIDIARY OF MINNESOTA MINING AND MANUFACTURING COMPANY

CHATTANOOGA 5, TENNESSEE

52ND YEAR OF CERAMIC LEADERSHIP

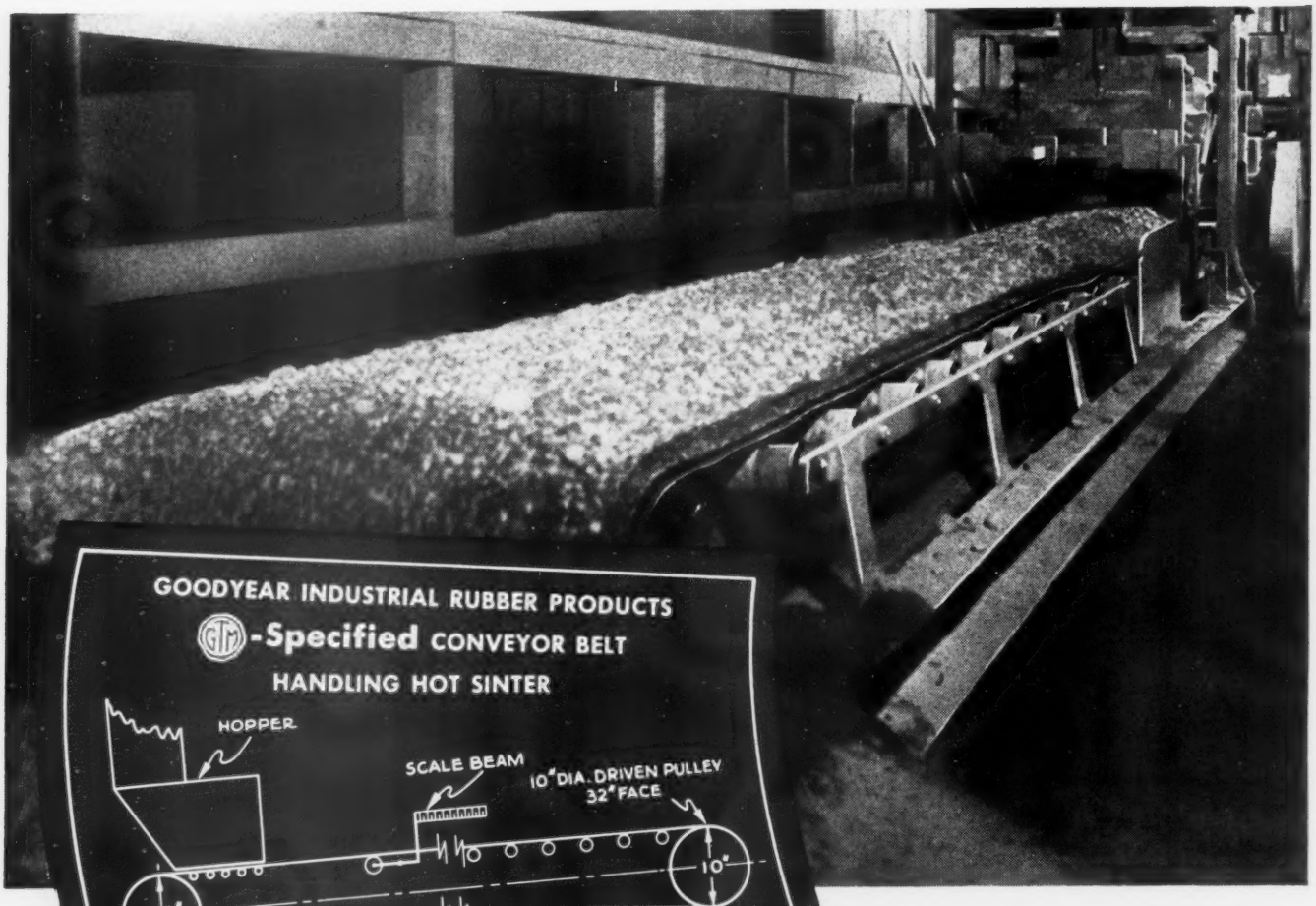
REPRESENTATIVES: M. A. BELL CO., 217 Lombard St., St. Louis, Mo. • 3201 Sherman St., Houston, Texas • 3430 Brighton Blvd., Denver, Colo. • CANADIAN FOUNDRY SUPPLIES & EQUIPMENT LTD., 4295 Richelieu St., Montreal 30, Quebec • 49 Main St., Toronto 14, Ontario. • FIRE BRICK ENGINEERS CO., 2400 S. 43rd St., Milwaukee 1, Wis. • E. J. WOODISON CO., 7415 St. Aubin Ave., Detroit 11, Mich. • 146 Chandler St., Buffalo 7, N. Y. • FRED H. McGEE, 120½ E. 7th St., Chattanooga, Tenn. • SMITH-SHARPE CO., 117 27th Ave., Los Angeles 58, Calif. • INDIANA PRODUCTS CO., 400 Union Bank Bldg., Kokomo, Ind. • HOFFMAN FOUNDRY SUPPLY CO., 1193 Main Ave., Cleveland, Ohio • EASTERN FOUNDRY SUPPLIES, INC., 109 Frelinghuysen Ave., Newark 5, N. J. • FOREMOST FOUNDRY SUPPLY CO., 645 N. Pine Ave., Chicago, Ill. • SPRINGFIELD FACING CO., N. Chicopee St., Willimansett, Mass.

Triple Service

Goodyear Conveyor Cuts Belt Cost $413—while handling almost three times the tonnage of the previous belt

Ordinary 5-ply conveyors handling hot sinter at 200°-300° F. failed in three months or less because of heat, caustic attack on the belt and small drive pulleys. The best record was 23,545 tons before failure on the top cover.

Then the G.T.M.—Goodyear Technical Man—recommended a 3-ply Goodyear Style 6740 "Hot" Belt. It outlasted any other belt ever tried—served almost 9 months—handled 68,750 tons of material. This thinner belt gave closer control on the weighing device measuring out sinter as well—saved an estimated $413.44 ($6.08 per M tons) on belt costs alone!



FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS *built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor. Look for him in the yellow pages of your Telephone Directory.*

GOODYEAR

THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network. THE GOODYEAR TELEVISION PLAYHOUSE—Every Other Sunday—NBC TV Network.

WHIRLMIX

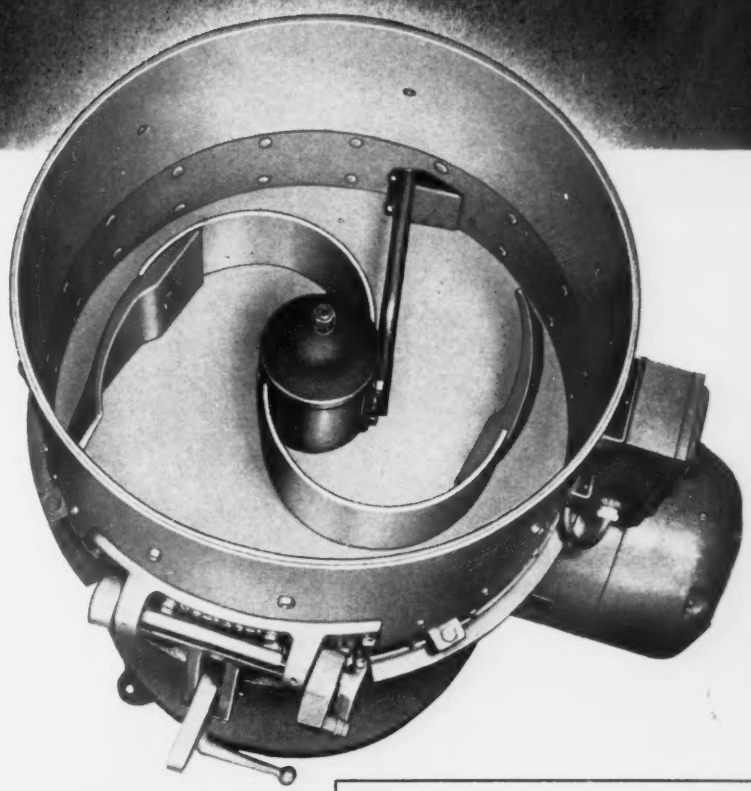
RUBBING ACTION PROTECTS SAND AS IT MIXES

• More thorough mixing *without* crushing or heating—more sand mixed per hour at lower cost—these are the big advantages provided by WHIRLMIX sand mixers.

Flexible, spring steel, whirling arms rub and squeeze sand with a regulated pressure that compensates for any variation in the amount of sand being mixed. *Correct* mixing pressure is always assured, to prevent the crushing or heating of sand grains. This exclusive mixing action produces a fluffy, well-aerated sand mixture. Because sand grains are not crushed, permeability can be maintained. Because sand is not heated, moisture can be controlled. And, because mixing is extremely thorough, a *minimum* amount of oil or cereal binders will produce maximum bond.

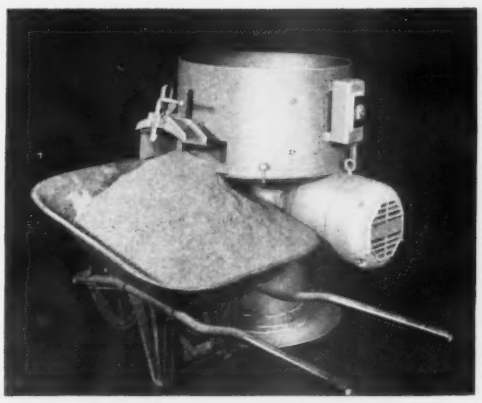
The whirling arms whirl sand from center to sides of the mixer, where the rubbing action takes place. Sand is firmly squeezed and rubbed between the rubbing shoes and mixer wall. Sand is squeezed upwards until it falls back into center of pan, where it is again picked up by the whirling arms to go through another mixing cycle.

WHIRLMIX mixers are easy and economical to maintain. Lower inner wall is tough, wear-resistant, synthetic rubber—bottom plate and rubbing shoes are long-wearing, high carbon steel—easily replaceable when necessary. WHIRLMIX mixers occupy little floor space, do not require foundations and are easily moved by crane or lift truck.



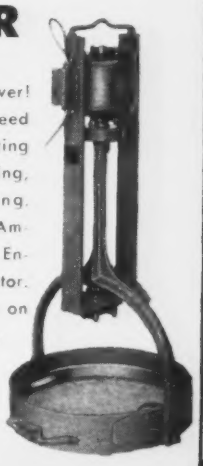
	BATCH SIZE		
	Core Oil Sand	Facing Sand	Dry Core Comp.
Lab. Model	15 lbs.	10 lbs.	10 lbs.
No. 100	100 lbs.	60 lbs.	60 lbs.
No. 300	300 lbs.	200 lbs.	200 lbs.
No. 600	600 lbs.	400 lbs.	400 lbs.
MIX TIME	3 min.	1½ min.	1½ min.

A new, 4-page, illustrated bulletin gives full particulars and specifications on all four models. Write for a copy for your file.



Discharge door, in models 300 and 600, is 28" above floor—high enough to accommodate a 3 cubic foot wheelbarrow.

FEDERAL'S LOWE SIFTER



Here's another money saver! An inexpensive, high-speed sifter with rotating-vibrating action . . . for faster sifting, better sand conditioning. Large, removable screen. Ample shovel clearance. Enclosed ball bearing motor. Write for complete data on the three popular models.

FEDERAL

The **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

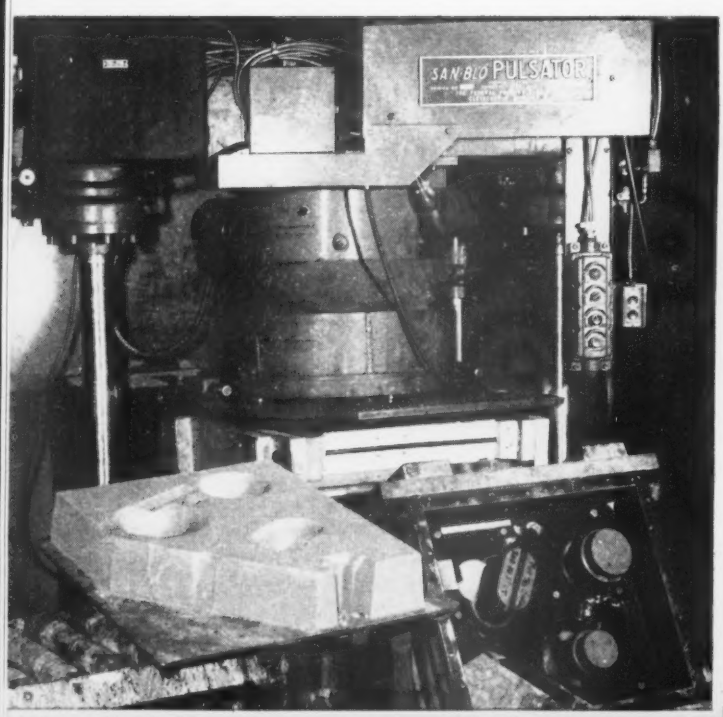
CHATTANOOGA · CHICAGO · DETROIT · LOS ANGELES · MILWAUKEE · NEW YORK

MINIMUM *core box*

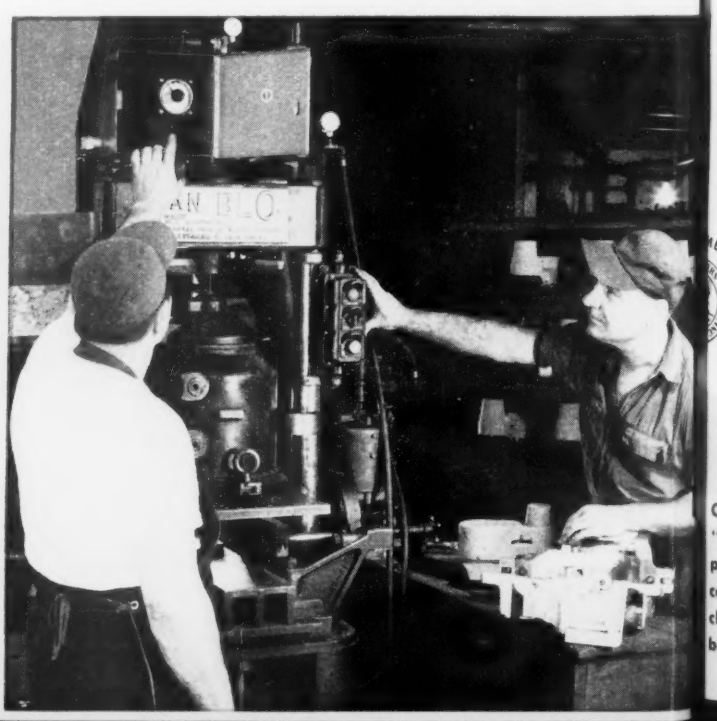
* "LOW PRESSURE PRE-FILL" —another SAN-BLO core blowing advancement by means of which *low* air *pressure* is used to *fill* core boxes . . . and *full line* pressure used to *pack* the sand.

"Sand abrasive wear was a problem on this job, but with the addition of the timer and filling at low pressure, this has been eliminated."

"Our foundry is a medium sized jobbing shop, running many short orders. Core box equipment is not always top notch. However, with the San-Blo we will be able to fit more and more jobs into blower production."



Continental Foundry of Chicago uses a "250" model SAN-BLO with "LPP" to blow this 195-lb. core. Wooden core box measures 27" x 23" x 8". Previously, 28 minutes were required for ramming, drawing, finishing and washing. Cores are now turned out, complete, in 4.21 minutes. "LPP" holds core box wear to a minimum.



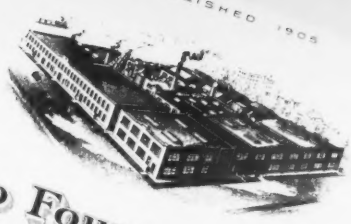
Chicago Foundry Co. uses a "40" model SAN-BLO with "LPP" to blow 8½-lb. doorcheck cores in a 3-piece aluminum box originally designed for handwork. 70 cores completed per hour —more than double previous production rate. 10,000 cores were blown in this box without noticeable core box wear.

...wear...with "LPP"*

"LPP" ALSO PROVIDES THESE ADVANTAGES

TELEPHONES BERKSHIRE 7-0250 51

ESTABLISHED 1905



PRIVATE SW C. M. ST. P.

CHICAGO FOUNDRY COMPANY
LIGHT GRAY IRON CASTINGS
2028 NORTH MAJOR AVENUE
CHICAGO 39

Federal Foundry Supply Co.
4600 East 71st Street
Cleveland 5, Ohio

July 3, 1953

Gentlemen:

Enclosed are some recent pictures of our 40-P-1 San-Blo in operation with the new Pre-fill attachment.

Mr. Stanley Chromzack, our core room foreman, has reported complete success of operations, and especially so on the core box illustrated here.

We have been particularly well pleased with the addition of the Pre-fill attachment. Sand abrasive wear was a problem on this job, but with the addition of the timer and filling at low pressure, this has been eliminated.

Our foundry is a medium sized jobbing shop, running many short orders. Core box equipment is not always top notch. However, with the San-Blo we will be able to fit more and more jobs into blower production.

We wish to thank you and your organization for the prompt manner in which you have handled any service that we have required.

Very truly yours,
CHICAGO FOUNDRY COMPANY
John M. Gajentan
John M. Gajentan
Vice-President

JMG:hn

MAKE IT BETTER

Y IRON-

Chicago Foundry Co. ran an interesting test with "LPP". The core box shown on opposite page was painted with patternmaker's purple dye. After 800 cores were blown, portions of the dye still remained, clearly demonstrating that "LPP" minimizes core box wear.

- LPP minimizes core box repairs.
- Permits blowing many wooden core boxes never blown before.
- Air pressure in open boxes near zero during pre-fill.
- Blow-outs at core box joints completely eliminated.
- Vent cleaning is minimized.
- Core box cleaning minimized.
- Core sticking minimized.
- Loose pieces will not wedge.
- Chills will stay in place.
- Wires will stay in place.
- Unusually clean operation.

"LPP" is now standard equipment on both the "40" series SAN-BLO Pulsator core blowers (for cores weighing up to 40 lbs.) and the "250" series (for cores up to 250 lbs.). Complete literature is available —please use company letterhead in writing.

FEDERAL

The **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

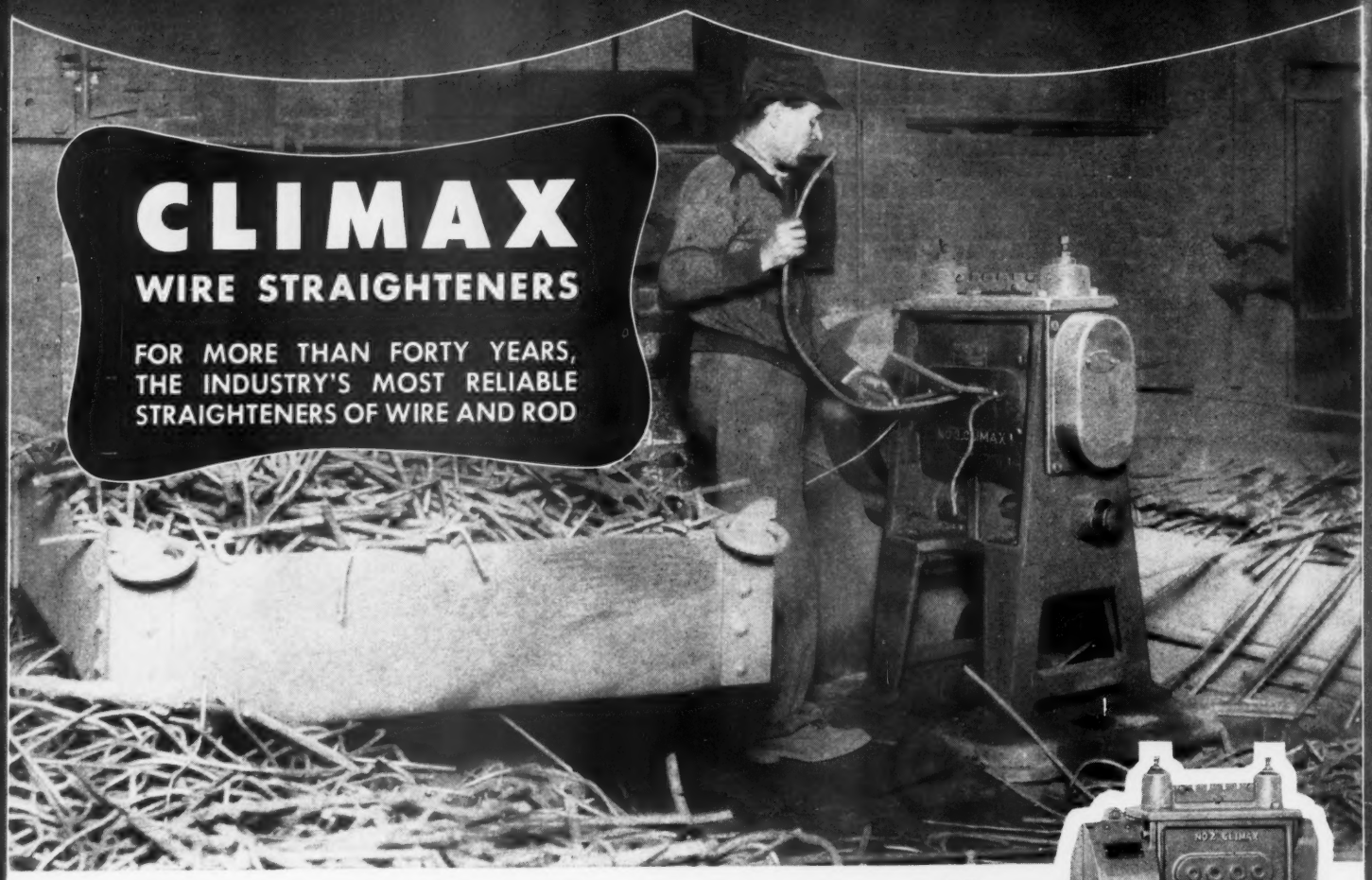
CHATTANOOGA · CHICAGO · DETROIT · LOS ANGELES · MILWAUKEE · NEW YORK

IN FRANCE—SA. PH. BONVILLAIN & E. RONCERAY, Rue Paul-Carle a Choisy-Le-Roi, Seine

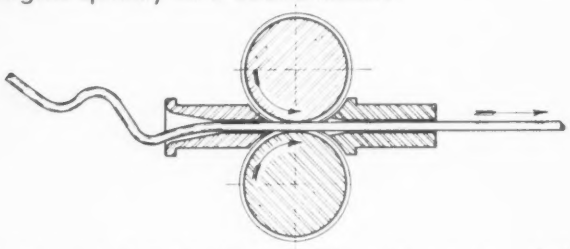
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

CLIMAX
WIRE STRAIGHTENERS

FOR MORE THAN FORTY YEARS, THE INDUSTRY'S MOST RELIABLE STRAIGHTENERS OF WIRE AND ROD

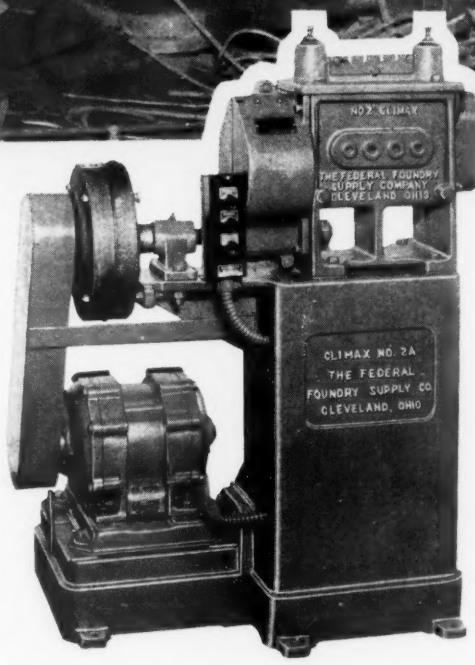


Reclaim your used core rods and wires and save money—with the CLIMAX. Operated safely and efficiently by unskilled labor. Straightens random lengths quickly and economically.



Bent wire is first checked in guide slots at top of the machine to determine proper feed hole, then inserted in feed hole, straightened between two heavy, alloy steel rolls under spring tension and ejected at back with a slight, natural bend, just right for core rod use.

Safety for the operator, as well as long life for the machine, is insured by enclosing gears and other moving parts. On motorized units, V-belts are enclosed and electrical wiring protected. Conveniently mounted controls and a reversible magnetic switch provide full protection for operator and straightening rolls, by enabling operator to stop or reverse machine instantly.



MODEL 2A
motorized

Handles 4 wire sizes, 1/16" to 1/4". A complete unit, ready for operation when connected to current supply.

MODELS AVAILABLE

The CLIMAX is offered in three sizes: to handle 4 wire sizes from 1/16" to 1/4"—4 sizes from 3/16" to 1/2"—and 5 sizes from 1/4" to 3/4". Each size may be furnished in three styles, as follows:

(1) Completely motorized—ready to operate.
(2) With gear reduction unit for your motor.
(3) With extended shaft for your own drive.

Write for additional information and prices, specifying wire sizes and model style.

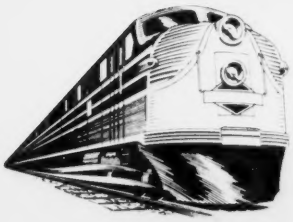
FEDERAL

The **FEDERAL FOUNDRY SUPPLY** *Company*

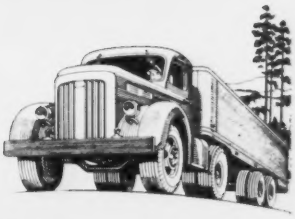
4600 EAST 71st STREET, CLEVELAND 5, OHIO

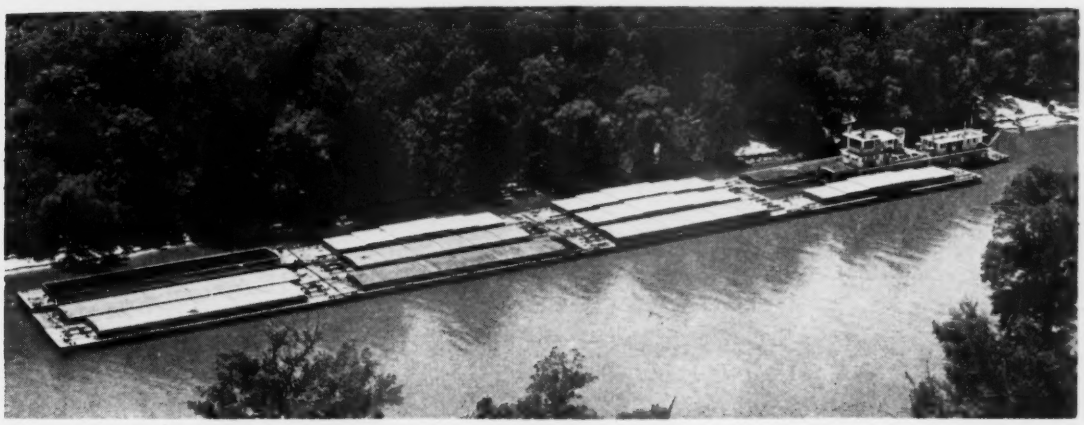
CROWN HILL, W. VA. · CHICAGO · CHATTANOOGA · DETROIT · MILWAUKEE · NEW YORK · RICHMOND · LOS ANGELES · UPTON, WYO.

WATER TRANSPORTATION



Also Serves Industries of BIRMINGHAM





Tow of Steel Products on Warrior - Tombigbee River

INDUSTRY'S great growth in the Birmingham area—geographic center of the South—has made it the South's rail center and trucking capital. This district is likewise served by the Southeast's greatest inland waterway—the WARRIOR-TOMBIGBEE RIVER SYSTEM.

This great waterway, with a nine-foot channel to Mobile, extends 408 miles from Mobile Bay to the Port of Birmingham—18 miles by rail and highway from the city's limits. On it 20 barge lines move more tonnage than on all other coastal rivers in the Southeast combined.

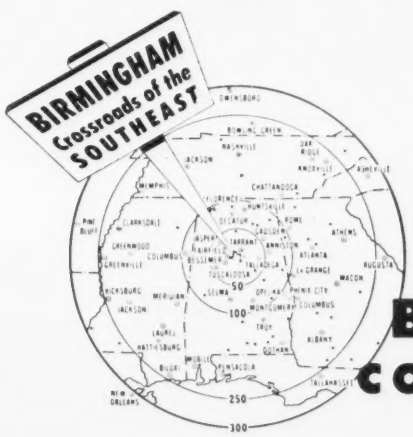
Up this river system, many of the heavy raw materials used by Birmingham's industries are imported from foreign sources and the East and West coasts of the U. S. A. Down it flows a wide variety of this district's mined and manufactured products, bound for worldwide markets. Five-day service is available to Mobile; eight-day service to New Orleans. These ports connect with those on the great Gulf Intracoastal Canal and the Nation's largest inland waterways system.

ALABAMA'S WARRIOR-TOMBIGBEE WATERWAY

INLAND WATERWAYS CONNECTIONS

* * * * * * * *

We invite your inquiry regarding the facilities and service available to you in the Birmingham District on the Warrior-Tombigbee River System and through its many railroad and truck lines. This Committee or any of the undersigned members will be glad to give you complete information at your request.



BIRMINGHAM COMMITTEE OF 100

1914 Sixth Ave., N., Birmingham, Ala.

Executive Committee

Gordon Persons, Governor of Alabama
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Donald Comer, Chairman Exec. Com., Avondale Mills
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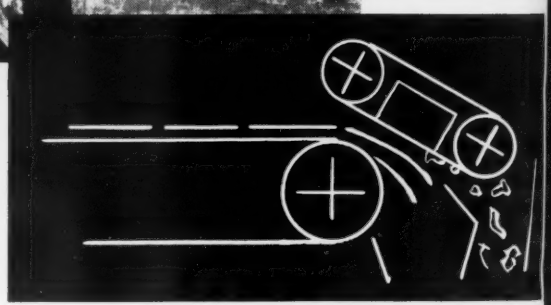
Here's one of the most important advances in magnetic tramp iron separation in years . . .

the NEW Dings "In-Line" *Self-Cleaning* SUSPENDED MAGNET

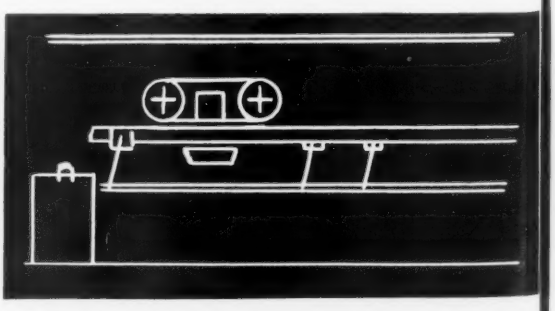
DINGS "In-Line" Magnets pull tramp iron of any shape out of conveyor belt burdens traveling at any speed. They do the job where even the largest diameter magnetic pulley would fail—where burden trajectories are almost horizontal.

Iron extraction with the Dings "In-Line" is parallel to burden travel and at the same speed. That's why this magnet can handle long iron rods with ease.

Dings "In-Line" is especially well suited for integration with pan-type conveyors being used by more and more foundries (see diagram). See your Dings representative for more information.



Dings "In-Line" extracts and discharges tramp iron in the direction of the burden flow—at the same speed as the burden moves. That's why it can pull out iron rods without tearing or gouging belts. "Selective" lifting of the iron to the magnet eliminates objectionable carryover of sand with the iron as usually experienced with magnetic head pulleys.



When used with a pan-type conveyor such as the Simplicity, Dings "In-Line" carries iron over the gap, through which the magnetically separated sand falls into a secondary conveyor, onto discharge end of conveyor.

Dings

DINGS MAGNETIC SEPARATOR CO.
4708 W. ELECTRIC AVE., MILWAUKEE 46, WIS.

Just mix with water and pour . . . the most convenient of all

High-Temperature Insulating Materials

For convenience, speed of installation, and minimum downtime you can't beat ALFRAX® castable aluminum oxide cements. To install, just mix them with water and pour—like regular Portland cement. They start to harden almost immediately after casting.

These ALFRAX castables, being made of aluminum oxide, are highly refractory. They will stand up under temperatures ranging from 2800 to 3100 F, depending on type—with practically no shrinkage. They are unaffected by furnace atmospheres and combustion gases. They have low heat capacity, and thereby permit faster heating of a furnace. Because the alumina in the cement is in the form of very small, hollow spheres which effectively block heat loss, ALFRAX castables are among the best insulating materials for very high temperature work.

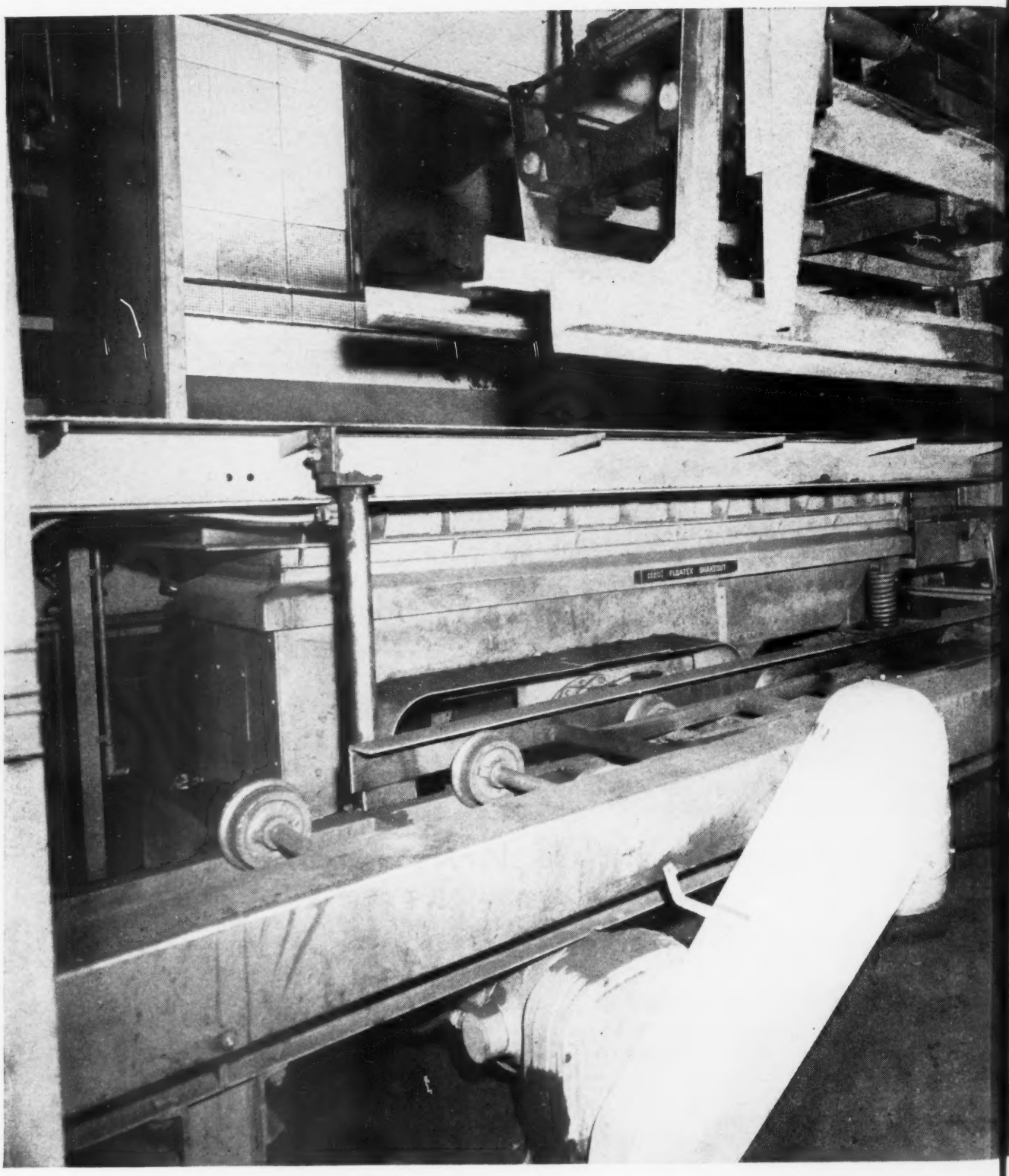
ALFRAX castables make ideal back-up linings for nonferrous crucible furnaces, either pit type or tilter. They make suitable burner blocks for core ovens or malleable annealing furnaces. They can be used to back up sidewalls of reverberatory furnaces. In short, they can be used almost any place where the convenience of a castable is desired along with assurance of longest possible life.

Why not check up? We make lining materials to fit *every* need—rings, ring segments, and cements—and will gladly furnish recommendations to fit *your* needs. Address Dept. A-103, Refractories Div., The Carborundum Co., Perth Amboy, N. J.

CARBORUNDUM

Registered Trade Mark

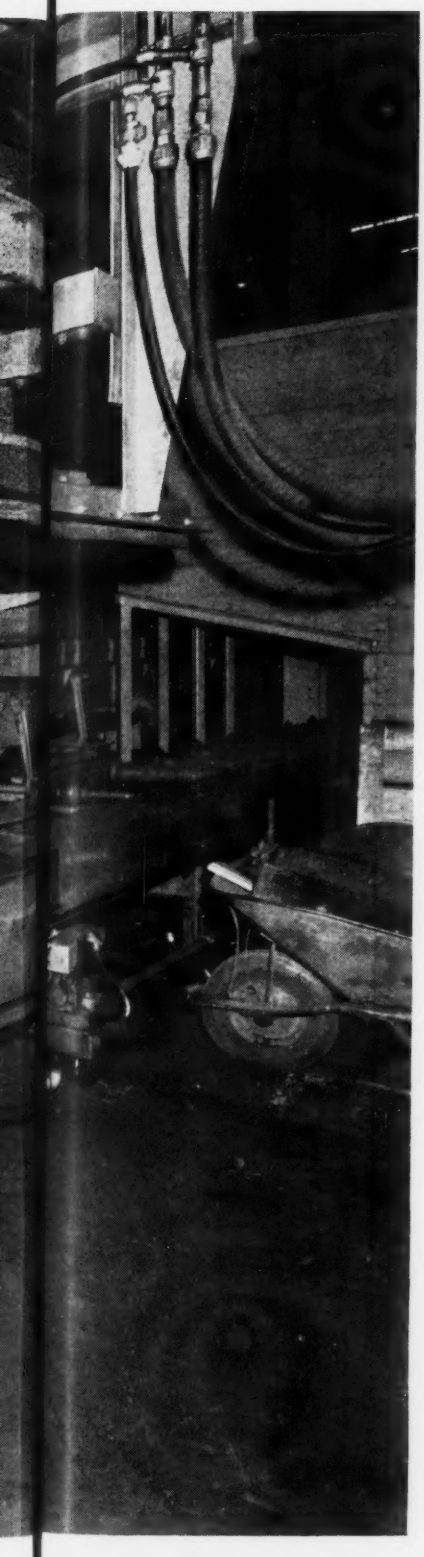
Mechanization Pays Off



HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

ffat American Brake Shoe



EQUIPMENT: One Hewitt-Robins triple-deck 4' x 12' Floatex Shakeout and double-deck 30" x 85' 0" Vibrating Conveyor—Two Belt and Bucket Elevators —Three 20" and five 24" Hewitt-Robins Belt Conveyors.

LOCATION: Pomona Foundry of the Brake Shoe & Castings Division, American Brake Shoe Company, Pomona, California.

PERFORMANCE: Hewitt-Robins Floatex Shakeout with special triple deck construction simultaneously handles 10 flasks, rapidly cleans castings and separates sand. Castings are fed to top deck of vibrating conveyor, sprued and sorted. Chill blocks are also reclaimed while sprues discharge over end of top deck to tote boxes for salvage. Vibrating conveyor handles sand on lower deck to fine screen and lump-breaker for reduction and cleaning. Belt conveyors and Belt and Bucket elevators provide continuous flow of material for the sand system.

RESULTS: Only three men required to shakeout, sprue and sort 5200 castings per 8 hour shift . . . shakeout production per man hour greatly increased.

ENGINEERING DATA

Floatex® Shakeouts: Single units with decks from 2' x 2' to 8' x 10'. Multiple unit arrangements up to 16' x 33' and capacities to 300,000 lbs.

Vibrating Conveyors: 8" to 48" wide, up to 150' length with one drive. Capacity to 200 TPH of 100 lbs. cu. ft. material at horizontal setting. Carries hot-cold, dry-moist, fine-large, loose or packaged materials.

Belt Conveyor Systems: Engineered and Sectional . . . Engineered: designed to suit, level or high lifts, light or heavy duty, all components matched to service, widths 14" to 72". Sectionals: standard units from stock complete with all components, 24" and 42" deep trusses, widths 18" to 36", motors to 30 HP.

Belt and Bucket Elevators: Standard centrifugal widths 6" to 18", standard continuous widths 9" to 26".

CHECK FOR INFORMATION ABOUT THESE JOB-TESTED PRODUCTS FOR YOUR FOUNDRY

- ☐ FOUNDRY SHAKEOUTS
- ☐ SSC UNIT

CONVEYORS:

- ☐ —Belt
- ☐ —Vibrating

BELTING:

- *☐ —Hot Materials
- *☐ —General Conveyor
- ☐ —Woven Wire

HOSE:

- *☐ —Air
- *☐ —Water
- *☐ —Steam
- *☐ —Fire
- *☐ —Twin-Weld®
- *☐ —Servall®
- *☐ —Water Suction
- ☐ BUCKET ELEVATORS
- ☐ MECHANICAL FEEDERS
- ☐ SAND SCREENS
- ☐ CAR SHAKEOUTS
- ☐ SCREEN CLOTH
- ☐ IDLERS
- ☐ BELT CLEANERS
- *☐ RUBBERLOKT® BRUSH

*For immediate information about these industrial rubber products, call your Hewitt Rubber Distributor. (See "Rubber Products" Classified Phone Book.)

Hewitt-Robins Incorporated
666 Glenbrook Road
Stamford, Connecticut

NAME

TITLE & COMPANY

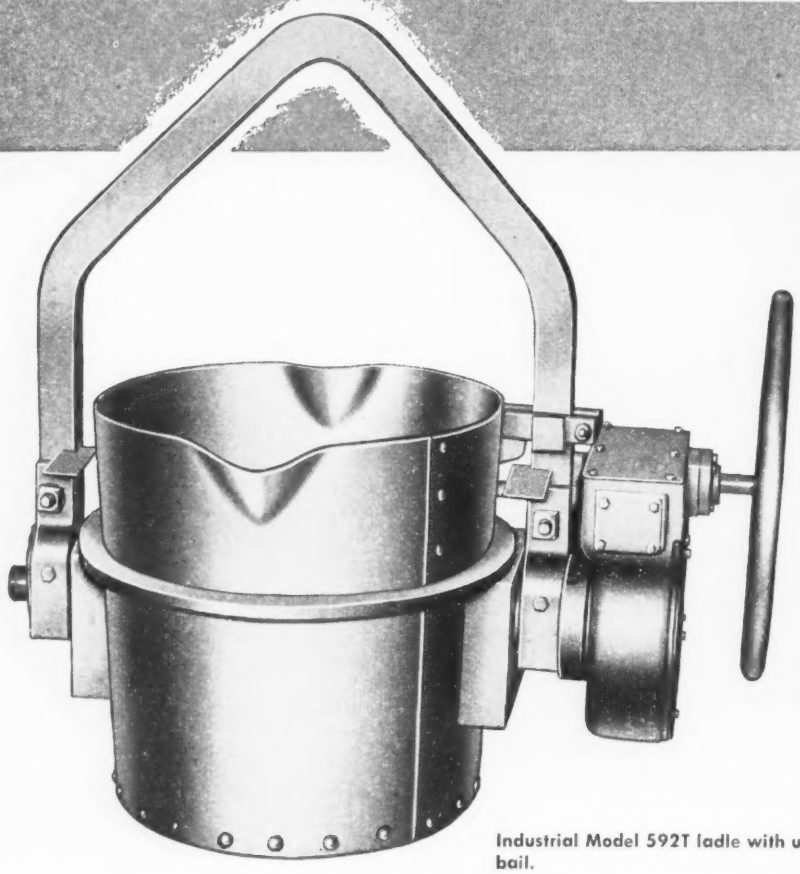
STREET ADDRESS

CITY PO ZONE STATE 1853

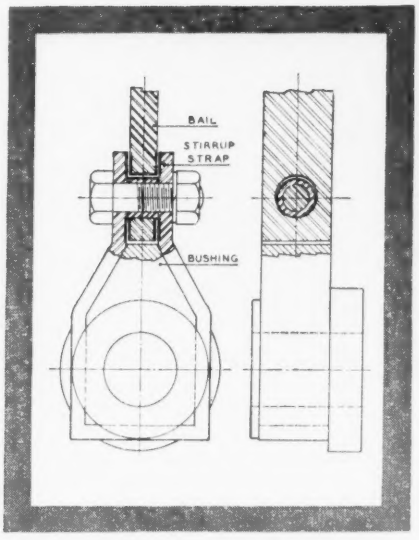
INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • EXPORT DEPARTMENT: New York City.

It's True . . . Binding due to heat distortion COMPLETELY ELIMINATED in this revolutionary Universal Bail Design



Industrial Model 592T ladle with universal bail.



More flexibility than a universal joint. Ample vertical and horizontal flexibility. Misalignment taken care of by rotating swivel action.

Here is one of the really fundamental advances in geared ladle design. Binding problems caused by the steady rise in pouring temperatures have been solved . . . with no sacrifice in strength, safety, or simplicity.

You get four distinct advantages with this new universal bail by Industrial Equipment:

1. Binding due to heat distortion is eliminated.
2. Binding due to misalignment is eliminated.
3. Gear wear due to binding is eliminated.
4. No lubrication or adjustment is ever needed.

This new bail is the result of a project on which Industrial Equipment has been working for over four years. Many novel and ingenious designs were proposed and discarded before the final design was accepted. Like all good things it is simple. Yet notice that in addition to simplicity it is rugged, safe, and dependable.

You should also know that this new bail has been thoroughly foundry tested. We emphasize this because the more severe the conditions, the more evident was its design superiority. Operators, for example, say they have never operated a ladle that was easier to handle *regardless of conditions.*

Look to Industrial Equipment for the really basic improvements in foundry pouring and handling equipment. *Write, wire, or telephone today for full details.*

Do you have our revised catalog No. 35?

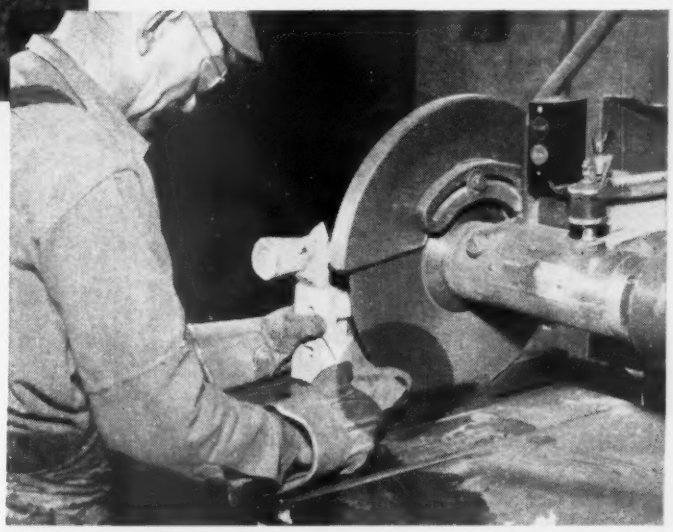
Industrial EQUIPMENT CO.

115 N. OHIO ST., MINSTER, OHIO

LADLES • BOWLS • SHANKS • BAILS • TONGS • SPECIAL EQUIPMENT

FLOORSTAND GRINDING . . . Whether you are grinding bronze castings like this worm or one of the other non-ferrous metals you can be sure of obtaining a Norton wheel of the correct abrasive, bond, grain, grade and treatment for minimum grinding costs.

PORTABLE GRINDING . . . can be done with tiny Norton mounted points in the hard-to-get-at places or with husky cup wheels on jobs like this bronze propeller. But on any job you'll like the way Norton wheels cut fast and hug the work.



CUTTING GATES AND RISERS . . . is quick and easy with Norton BN wheels whether you use this type of grinder or a swing frame. The BN wheel is sturdy but flexible for maximum resistance to breakage — also it's fast cutting and long lived.

Here's the real "TOUCH OF GOLD" for your soft-metal grinding

You get grinding that improves product quality and cuts costs — you get the real "Touch of Gold" — when you have Norton wheels working for you. A Norton grinding wheel *adds to the value of everything* it touches.

For your non-ferrous grinding, in particular, Norton CRYSTOLON* wheels are the best you can get for any low speed machine. They last long, but not *too* long. They wear at the right rate for the work.

For your high speed machines, Norton ALUNDUM* wheels are unbeatable. Sharp cutting and cool running, they're the wheels to use when you grind fast.

Your Norton Distributor

can supply you with the *right* Norton wheels. See him, or write to Norton Company, Worcester 6, Mass. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON
ABRASIVES

Making better products to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

ANOTHER MULTI-WASH SYSTEM — modelled for the modern mechanized foundry

Here in this foundry, modern mechanization and Schneible dust control are combined to provide, as nearly as possible, an ideal production atmosphere.

Sixty-five units of Schneible dust and fume control equipment help provide conditions that promote good health and greater productive effort.

Schneible patented features, a result of many years of dust control experience, give the utmost in efficient performance and low-cost maintenance.

Clients by the scores have enjoyed trouble-free operation of Schneible dust control equipment over the years.

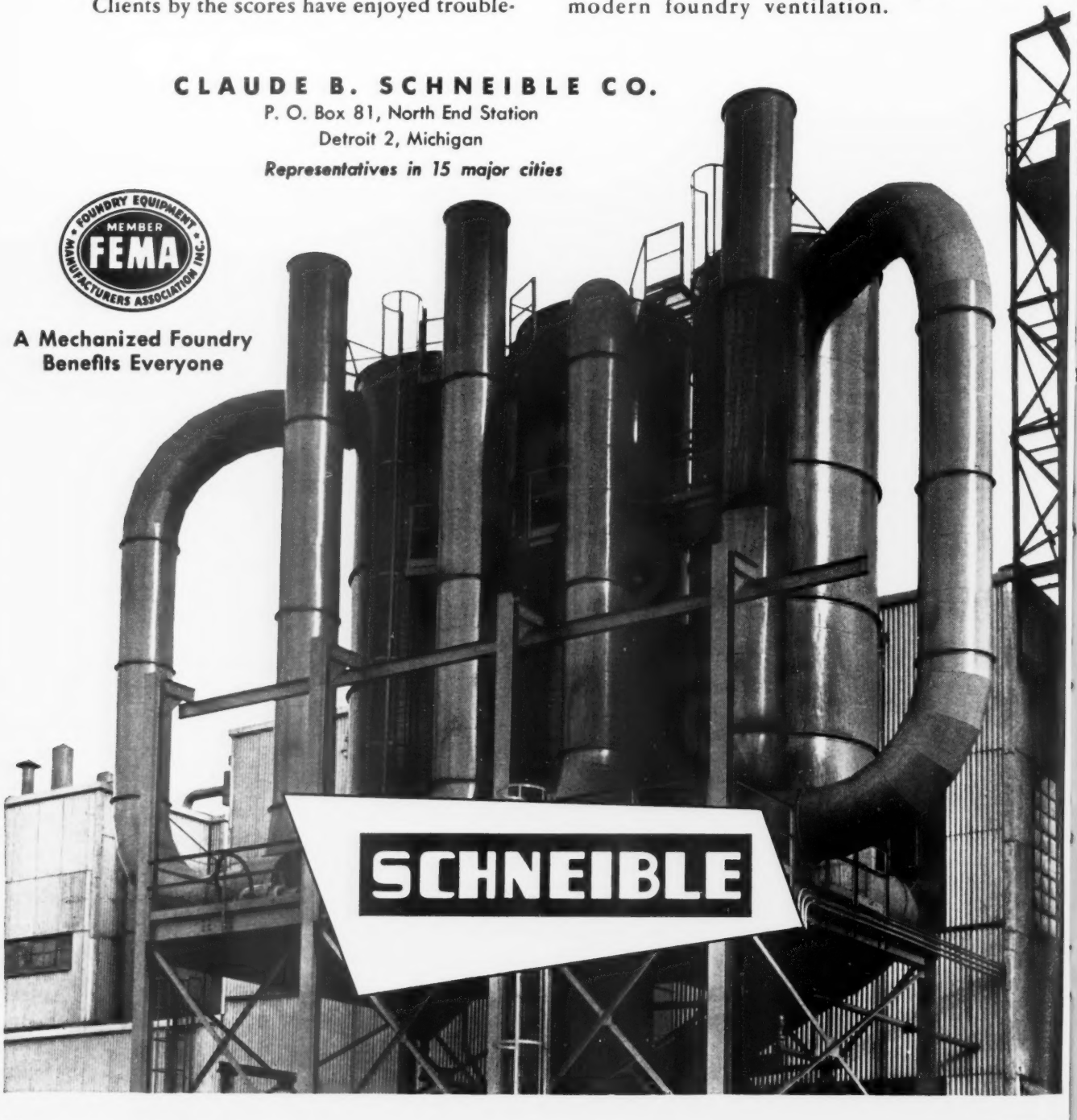
Whether the job is large or small, Schneible engineers figure all the angles and come up with dollar-saving answers on overall operation. Controlled air velocities (summer and winter) . . . continuous re-use of water . . . localized collection . . centralized disposal . . . no dust handling after collection.

Call in Schneible for a money-saving solution to your dust, fume or odor control problem. Call on experienced engineers in modern foundry ventilation.

CLAUDE B. SCHNEIBLE CO.
P. O. Box 81, North End Station
Detroit 2, Michigan
Representatives in 15 major cities

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

A Mechanized Foundry Benefits Everyone



Late Foundry News

September 28, 1953

BUSINESS CONDITIONS: Signs of readjustment in major sectors of the economy have become more prominent the last six weeks, but there is little evidence as yet that these adjustments will be cumulative in character and foreshadow a major downturn in business activity in the months immediately ahead. That opinion was expressed by Martin R. Gainsbrugh, chief economist, National Industrial Conference Board, speaking before the National Foundry Association's annual meeting in New York, Sept. 17.

Monthly business survey of the National Association of Purchasing Agents reports that September showed no significant improvement over August. Most price changes were downward, although steel and gray iron castings are included among the few commodities for which higher prices were reported during the month. The survey also noted sharper competition for business and declining employment. While a fourth quarter tapering in business is looked for, a high level of activity still is anticipated.

DIP AT DETROIT: Foundry operations in and around Detroit are slowing down. The dip is putting a number of ferrous and nonferrous shops on a four-day week after a summer of declining backlogs but relatively full production.

Several factors account for the slowdown. One is the Livonia fire which crippled output of five or six car builders. Another is the seasonal suspension in production for model changeovers which begin each year about this time and run until January or later. Cutbacks in defense work have affected producers of steel castings.

LAKE CITY SOLD: Controlling interest in the Lake City Malleable Co., Cleveland, has been acquired by Machinery Terminals Inc., Akron. Liquidation of all or a portion of the company's plants in Cleveland, Columbus and Ashtabula, O., or sale of one or more of the plants as foundries, is reported being considered.

PRICE TRENDS MIXED: Recent weakness in prices of iron and steel scrap has carried the market for a number of grades well below levels prevailing a year ago. In several of the leading foundry centers current quotations on No. 1 cupola cast are $8 to $14 a ton below the market of late September, 1952. Heavy breakable cast is down as much as $15 and malleable is off $10 to $12.

Steelmaking scrap grades also are easier, the 12-month declines ranging from $2 to $5 for short steel rails to $7 to $10 for No. 1 heavy melting steel. On the other hand, No. 2 foundry and malleable pig iron grades are quoted $1.50 a ton higher than they were 12 months ago. Foundry grades of brass and bronze ingots are bringing more than 2 cents a pound less than a year ago, while secondary aluminum ingots are up about that amount.

MORE ALUMINUM: Fourth quarter supplies of both primary and secondary aluminum to be available to civilian users are expected to be 2 to 3 per cent larger than the third quarter tonnage. Imports may boost the increase to 6 per cent, according to ODM. In addition, the largest quarterly tonnage to date is scheduled to be added to the national stockpile. Primary domestic aluminum production this year is expected to total 1,260,000 tons, a 35 per cent increase over 1952 and comparing with 719,000 tons in 1950.

DEPRECIATION SLOW-DOWN: Granting of certificates by the government to permit rapid tax write-off on new or expanded plant facilities is being terminated in many industries. Goals set for production capacity to meet defense needs in a number of industries have been met; in some industries the goals have been scaled down. Foundries recently granted certificates of necessity include Warren Foundry & Pipe Corp., Phillipsburg, N. J., $324,313, and L. Schreiber & Sons Co., Norwood, O., $39,000.

FORD EXPANSION: Decision of Ford Motor Co. to build another engine plant near its existing one on Cleveland's outskirts will require increased production from the company's adjacent foundry. The new engine plant, to be in operation early in 1955, will employ about 3000 persons in building V-8 engines. The original plant has been turning out six-cylinder engines and shortly will add Mercury V-8s to its output.

Ray H. Sullivan, Ford vice president and group executive, recently said that additional equipment would be installed in the foundry and another 1000 employees hired. The Ford foundry was designed to permit future expansion in capacity, and its floor area of 1,200,000 square feet is ample for the added work. For instance, space is avail-

able along the plant's existing eight molding lines for two more lines. Another new Ford facility planned for the Cleveland area is a stamping plant scheduled for operation early in 1955.

COPPER SET-ASIDE: Percentages of copper and copper-base alloy products required to be set aside by producers under the new Defense Materials System for delivery of military and atomic energy orders during the first quarter of 1954 show reductions in most cases compared with present percentages. In the case of copper foundry products the cut is from 30 per cent to 27.

PERSONALS: Everett G. Fahlman, president, Permold Co., Medina, O., has been appointed deputy director of the Aluminum Division, NPA. Mr. Fahlman, on loan to the government, also is president of Gordon Mfg. Co., Ltd., Wallaceburg, Ont. . . . Marvin A. Joy, Chase Brass & Copper Co., Waterbury, Conn., is the new director of the NPA Copper Division.

MISCELLANY: Lindgren Foundry Co., Batavia, Ill., is starting construction shortly of a new patternmaking and storage building to replace facilities destroyed in a $1 million fire in July. Luria Engineering Co., Bethlehem, Pa., is the contractor . . . Pekay Machine & Engineering Co., Chicago, specialist in foundry sand handling systems and equipment, has closed its Detroit branch office and transferred personnel to expanded quarters at the home office . . . Freight car orders placed in August involved 3913 units, largest monthly figure since January. Backlogs on Sept. 1 totaled 45,735 . . . Former officials of the Falcon Bronze Co., Youngstown, O., which quit business recently after a prolonged strike, are reported planning to establish a new foundry in Lowellville, O. . . . Canada Iron Foundries Ltd., Montreal, Que., officially opened its new ingot mold foundry at Hamilton, Ont., Sept. 17 . . . Expenditures for new construction in August were 1 per cent ahead of July and 7 per cent larger than a year ago. First eight months of 1953 show an 8 per cent gain over the 1952 period.

PRICES OF FOUNDRY METALS AND COKE

(As of Sept. 28, 1953)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$16.50-17.00
New River	20.80
Wise County	15.95

OVEN

Birmingham	$21.65
Chicago	24.50
Detroit	25.50
Erie, Pa.	25.00
Everett, Mass.	26.00
Indianapolis	24.25
Kearney, N. J.	24.00
Milwaukee	25.25
New Haven, Conn.	23.45
Painesville, O.	25.50
Philadelphia	23.95
Portsmouth, O.	24.00
St. Louis	26.00
St. Paul	23.75
Swedeland, Pa.	23.85
Terre Haute, Ind.	24.05

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$58.50	$59.00
Birmingham	52.88	....
Buffalo	56.50	57.00
Chicago	56.50	56.50
Cleveland	56.50	56.50
Everett, Mass.	63.25	63.75
Fontana, Calif.	62.50	....
Geneva, Utah	58.00	....
Granite City, Ill.	58.40	58.90
Lone Star, Tex.	52.50	52.50
Neville Island (Pittsburgh)	56.50	56.50
Steelton, Pa.	58.50	59.00
Swedeland, Pa.	58.50	59.00
Toledo, O.	56.50	56.50
Troy, N. Y.	58.50	59.00
Youngstown, O.	56.50	56.50

NONFERROUS INGOT

BRASS AND BRONZE: Red brass, No. 115, 24.50; tin bronze, No. 225, 35.25, No. 245, 29.50; high-leaded tin bronze, No. 305, 28.75; No. 1 yellow, No. 405, 20.75; manganese bronze No. 421, 25.25.

ALUMINUM: 99 per cent plus, primary ingots 21.50c. Secondary No. 12 alloy 21.50-22.00. Deoxidizing grades: No. 1 21.75-23.50; No. 4 18.50-20.00c.

MAGNESIUM: 99.8 per cent standard ingots 27.00c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 29.00-30.00c, Connecticut valley.

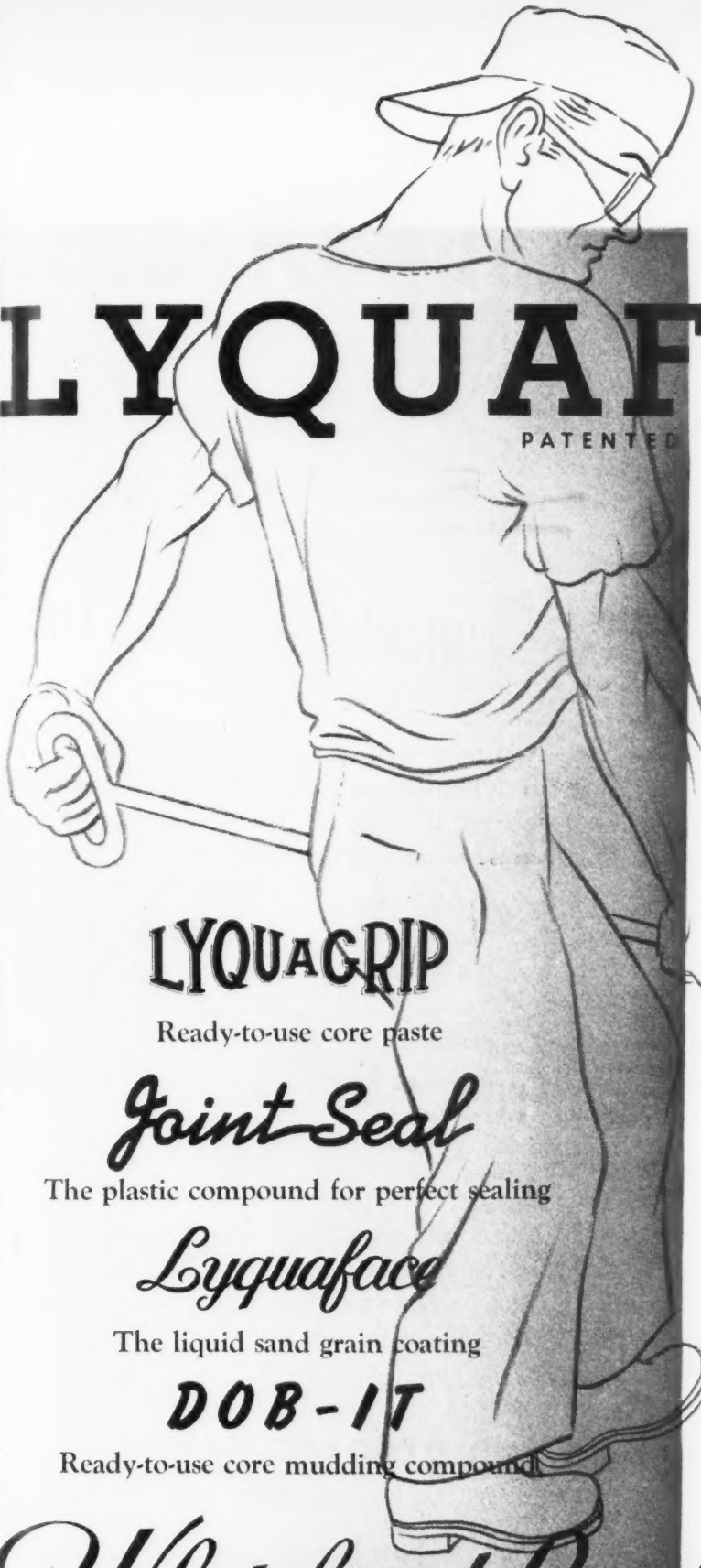
ZINC: High grade 11.35c, delivered. Die casting alloy 14.50c, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$26.00-26.50	**$41.00-42.50	**$30.00-31.00	.....	.....	.....	$42.00-43.00
Boston*	26.00-26.50	**29.00-30.00	.....	.....	**36.00-37.00	.....	.....
Buffalo	39.00-40.00	**33.50	.....	.....	**37.50-38.00	.....	47.00-48.00
Chicago	35.00-36.00	34.00-36.00	.....	41.00-43.00	40.00-42.00	40.00-42.00	45.00-47.00
Cincinnati*	33.00-34.00	43.00	36.00	.....	47.00	45.00-46.00	49.00-50.00
Cleveland	32.00-33.00	41.00-42.00	28.00-29.00	42.00-43.00	45.00-46.00	45.00-46.00	50.00-52.00
Detroit	34.00-35.00	43.00	29.00-30.00	42.00-43.00	.....	44.00	.....
Los Angeles	24.00	**37.00-40.00	.....	.....	.....	.....	.....
New York*	26.50-27.50	30.00-31.00	.....	.....	.....	.....	.....
Philadelphia	34.00-35.00	35.00-36.00	27.00	.....	42.00-43.00	.....	.....
Pittsburgh	39.00-40.00	40.00-41.00	37.00-38.00	.....	47.00-48.00	.....	51.00-53.00
St. Louis*	33.00-35.00	38.00-39.00	28.00-29.00	38.00-40.00	.....	41.00-42.00	46.00-47.00
San Francisco	27.00	39.00	36.00	39.00	43.00	.....	.....
Seattle	31.00-33.00	**30.00-35.00	**25.00-30.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point.



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LYQUAFLOUR

PATENTED

This *ONE* additive to sand has all the properties of several other products

1. **LYQUAFLOUR** permits the use of ONE carbonaceous material to obtain the properties of several.
2. **LYQUAFLOUR** peels your casting.
3. **LYQUAFLOUR** corrects expansion problems.
4. **LYQUAFLOUR** permits hard ramming.
5. **LYQUAFLOUR** imparts flowability to sand.

6. **LYQUAFLOUR** requires no rigid control.
8. **LYQUAFLOUR** being slightly moist is not dirty or dusty.
7. **LYQUAFLOUR** is not subject to spontaneous combustion.

You owe it to yourself to investigate our claims.

LYQUAGRIP

Ready-to-use core paste

Joint-Seal

The plastic compound for perfect sealing

Lyquaface

The liquid sand grain coating

DOB-IT

Ready-to-use core mudding compound

Whitehead Brothers Company

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324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
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HOW

WHEELABRATOR® STEEL SHOT

Strikes at Cleanin C

LESS ABRASIVE CONSUMPTION

General Heat Treating Co., Syracuse, N. Y. is able to clean 217 lbs. of heat treat work for every pound of Wheelabrator Steel Shot consumed, compared to only 34 lbs. of work cleaned per lb. of malleabilized grit formerly used.

INCREASED PARTS LIFE

At a progressive Eastern Steel Foundry the use of Wheelabrator Steel Shot resulted in a 150% increase in blade life with a corresponding increase in the usable life of other machine parts.

LOWER CLEANING COSTS

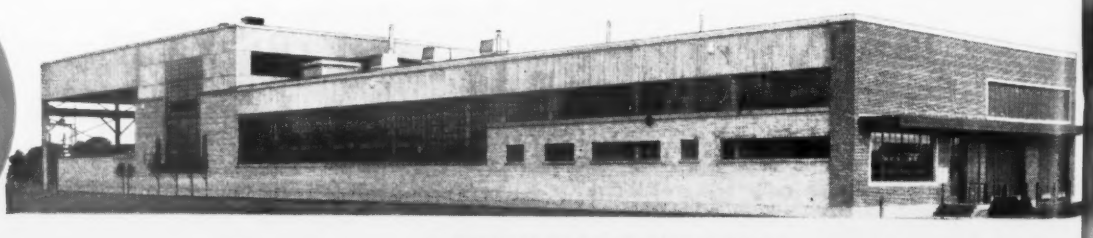
A large New York gray iron foundry slashed abrasive costs from $2.49 per hour to $1.54 . . . a 38% reduction . . . when they switched from chilled iron grit to Wheelabrator Steel Shot.

LESS MAINTENANCE LABOR

Due to the 300% increase in machine parts life resulting from the use of Wheelabrator Steel Shot, maintenance labor costs were slashed at a prominent Eastern plant.

REDUCES SHIPPING, HANDLING AND STORAGE COSTS

American is the only Blast Equipment Manufacturer Producing Steel Shot



AMERICAN'S STEEL SHOT PLANT

the HEART of Your Cost Reduction Problem

19 CONTROL CHECKS FOR QUALITY ASSURE PEAK PERFORMANCE

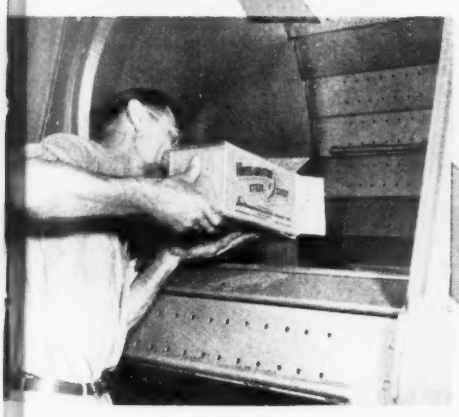
It took a new plant and new production methods, unique in the industry, to produce this properly balanced, metallurgically superior steel shot. 19 control checks insure the highest standard of uniformity in structure, hardness, solidity, toughness, size and shape. This meticulous attention to every phase of production is your assurance that Wheelabrator Steel Shot will provide peak performance and economy for your cleaning operations.

Another American FIRST

50 LB. CARTONS and PALLETIZING

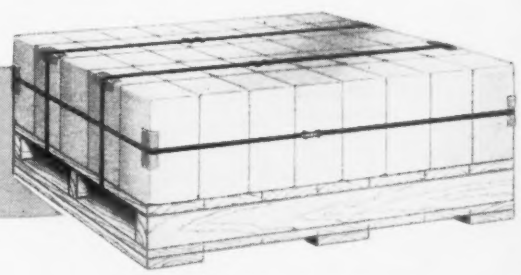
For Safety - Convenience - and Lower Cost to You

Wheelabrator steel shot is now packaged in strong, easy-to-handle 50 lb. cartons—more rugged and durable than antiquated burlap bags (100 lbs.). Shipments of 1 Ton or more are securely strapped to expendable pallets (40 cartons to a pallet) for safer transportation and easier handling and storage. *All at no extra cost!* Another "plus" for Wheelabrator Steel Shot — the modern blasting abrasive.



Easy-to-carry, easy-to-pour, this new carton reduces strain and fatigue in abrasive handling.

50 lb. carton



A Palletized 1-Ton Shipment

Send for Bulletin No. 89

Bulletin 89 tells the complete story about "Wheelabrator" Steel Shot and what it means to the user in terms of performance and economy. Write for your copy today.

THE AMERICAN MOLDER

American

WHEELABRATOR & EQUIPMENT CORP.

505 S. Byrkit St., Mishawaka, Indiana

TWO 3F SIMPSON MIX-MULLERS®

help make casting quality live up to the name...

SUPERIOR

Read what Superior Foundry, Inc., Cleveland, Ohio, has to say about the performance of their two Simpson 3F Mix-Mullers:

Mr. Clem Swencki
Quality Control Director
Superior Foundry, Inc.

"Our Quality is the same as our name. That is our slogan and our two 3F Simpson Mix-Mullers help us produce the high quality castings for which Superior Foundry, Inc., is noted nationally.

. . . Our average variation in moisture in the molding sands is 0.2 of one percent.

. . . The molders and foremen now say that the system sand from the Simpson Mix-Mullers is better than our facing made previously, and that we have eliminated facing on many of the patterns with excellent results in casting finish.

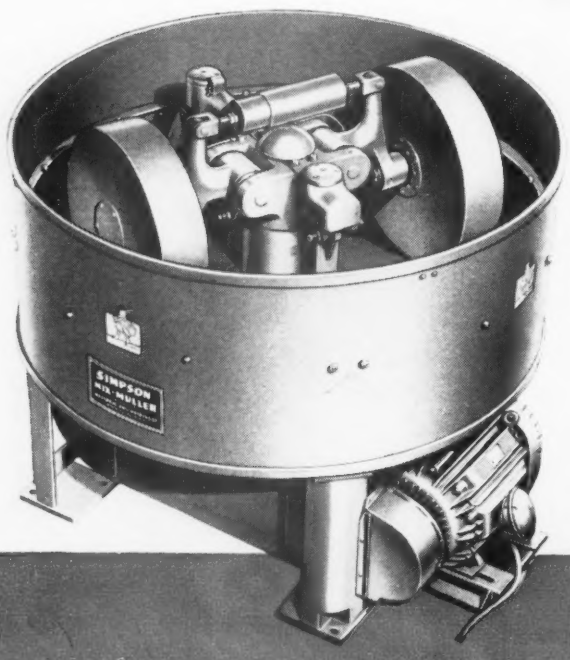
. . . Use of bond in the system sand has been cut 50 percent with no loss in quality".

CLEM SWENCKI
Quality Control Director

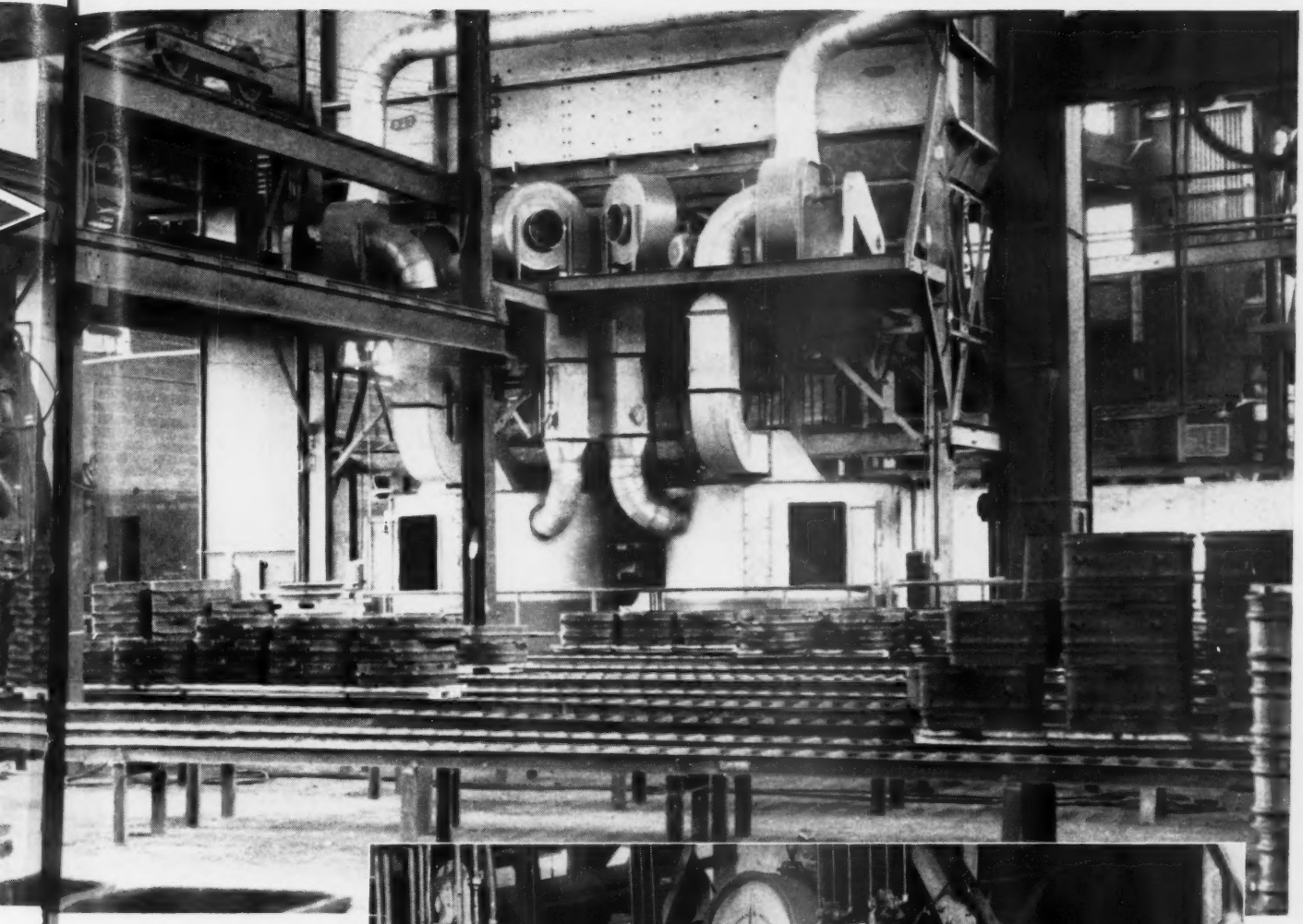
The two 3F units referred to were installed in this progressive Cleveland foundry as a vital part of a new sand preparation system completed within the past year. The two Mix-Mullers prepare 400 to 500 tons of sand in 8 hours, supplying ten heavy molding cope and drag floors.

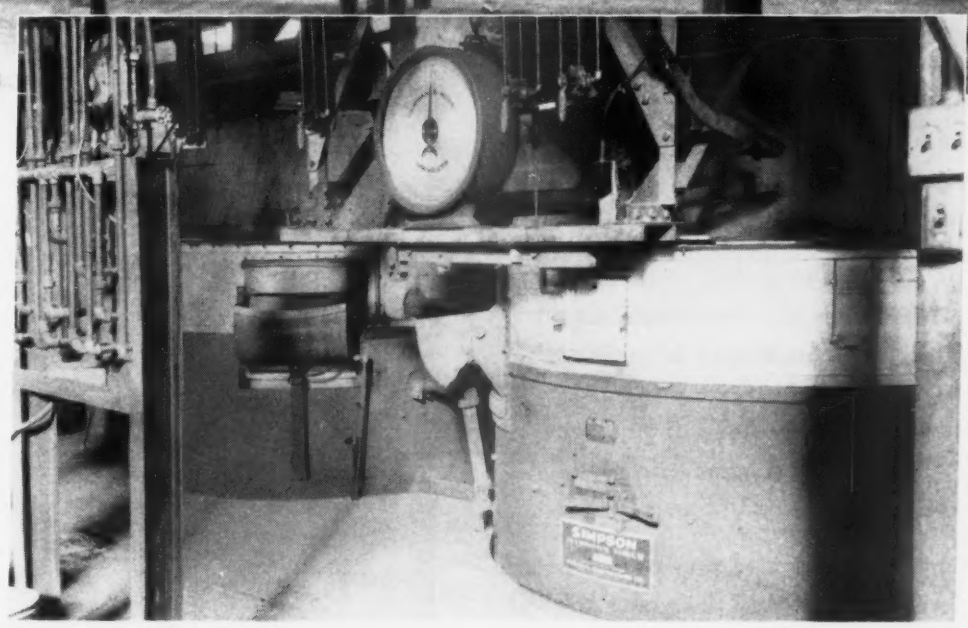
The mixer operator, through the use of well-integrated National equipment, meets the demands for many types of high quality sands required at the same time on the different molding floors.

To sum up Superior's experience with their Mix-Mullers we quote from Mr. William Hampton, Plant Engineer . . . *"Simple in operation, easy for maintenance, fast and dependable, the 3F Simpsons do an excellent job for us."*



At the left is a close-up of a 3F Simpson Intensive Mix-Muller, showing the sturdy construction, and the adjustable muller design which permits a wide range of sand types to be handled.





Shown above is a view of the modern sand preparing plant installed at Superior Foundry, Inc., Cleveland, Ohio. Equipment includes two 3F Simpson Mix-Mullers, traveling weigh larry, 200-ton capacity sand storage bin, water meters and cooling hoods . . . all installed by National Engineering Co.

At the right is a close-up of the two 3F Simpson Mix-Mullers and traveling weigh larry.

Let our experienced engineering staff help you increase production, improve casting quality, and reduce costs. Write for further information.

National Engineering Company
(Not Inc.)
608 Machinery Hall Bldg. • Chicago 6, Illinois

SIMPSON
Intensive
MIX-MULLERS

Manufacturers and Selling Agents: For Continental European Countries — George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions — August's Limited, Halifax, England; for Canada — Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand — Gibson, Battle & Co., Pty., Ltd., Sydney, for Argentina, Brazil and Uruguay — Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico — CASCO ,S. De R.L., Mexico, D.F.

HERE'S AN AGITATOR YOU'LL LIKE . . .

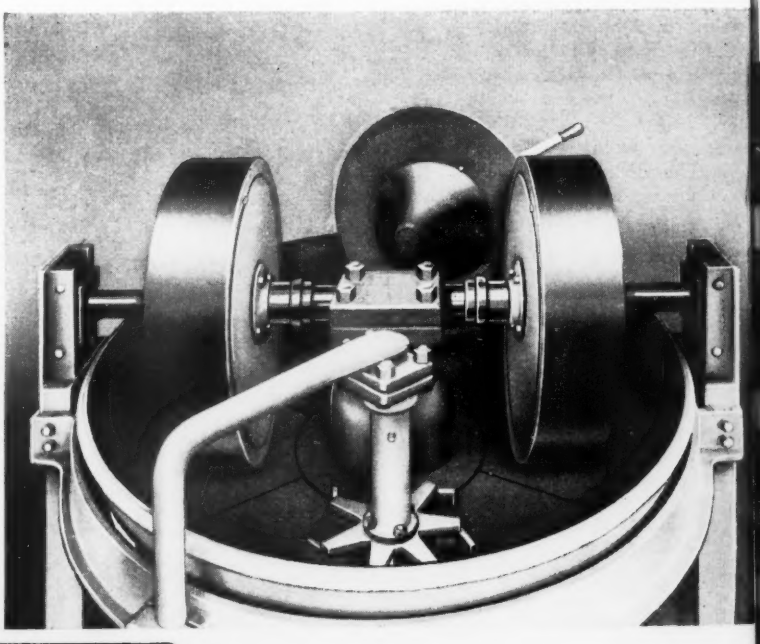
and it's in all

Clearfield Mixers

That star-shaped agitator in the pan of all Clearfield Mixers does a lot of stirring up. But it's sand, not trouble, that gets stirred and the result is six definite benefits to your sand preparation process:

1. Mixing proceeds more rapidly.
2. All lumps are broken down.
3. Formation of cakes is prevented.
4. Bottom surface freed of all material.
5. Sand quality is improved.
6. Clean emptying of pan is provided.

Whatever your sand preparation needs, there's a Clearfield Mixer with the star-shaped agitator to meet your problem. Write today for catalog No. 83 for complete details.



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CLEARFIELD
PENNSYLVANIA, U. S. A

CLEARFIELD
MIXER
MIXES, TEMPERS
AERATES

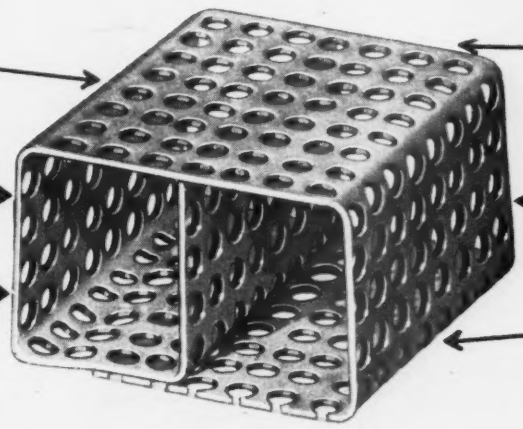
the perfect COMBINATION of SHAPE and SIZE for LIGHT CORE castings

fine FANNER perforated chaplets

PERFORATIONS
Large number of perforations in light metal insure perfect fusion in light castings.

LARGE SUPPORT AREA
Widely distributed support area holds core more securely in place.

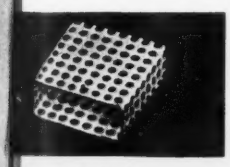
FLEXIBLE SHAPE
Made in 10 styles in any shape or contour required, flat, or curved to any radius, wedge-shape, bridged or with extended ends.



WILL NOT CHILL
Because of the large perforated area, there is no concentration of metal at any point to chill and cause leaks.

ACCURATELY MADE
Produced to exacting standards on specially designed machines to meet specifications.

PERFECT VENT
There are no gas or air pockets to cause "blow holes", so that perfect ventilation is secured.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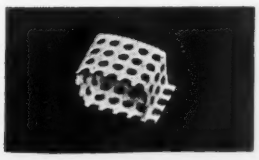
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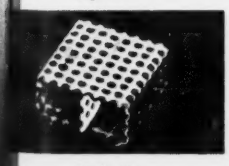
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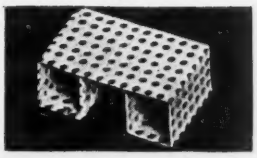
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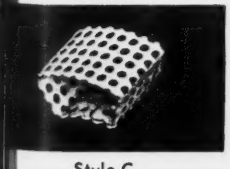
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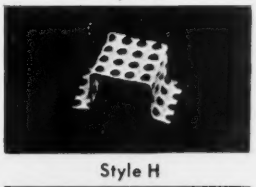
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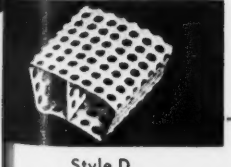
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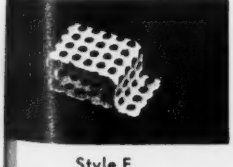
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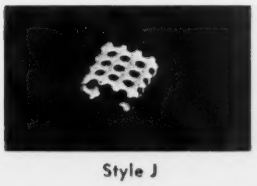
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● Here is the most versatile of chaplets for light core work. Gives you the exact features you want to fit your particular need—the right shape, the right size, the right construction, the right material. Fine Fanner Perforated Chaplets are ideally suited to a wide variety of applications where there is no need for heavy core support. Made of tin coated sheet steel for ferrous castings—of aluminum, copper or brass for use in castings of these metals. The perforated design offers a great number of advantages; more perfect fusion in light sections, perfect ventilation eliminates pockets that cause "blow holes", there is no concentration of metal at any point to chill and result in leaks. Wide support area holds core securely. Shape can be designed to fit almost any contour. They are available in a large number of types, some of which are illustrated, and an extremely wide range of thicknesses and sizes. Get acquainted with fine Fanner Perforated Chaplets by sending for a free copy of the Fanner Chaplet Catalog today.

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Designers and Manufacturers of Fine Fanner Chaplets and Chills

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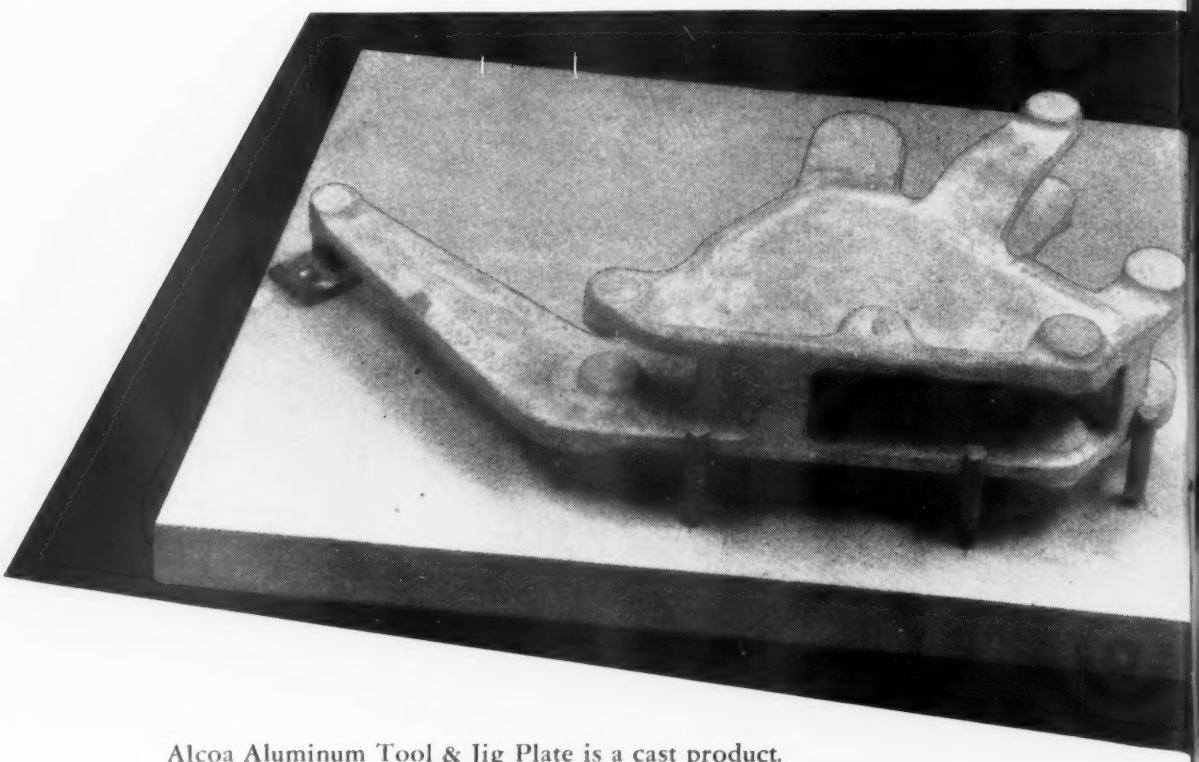
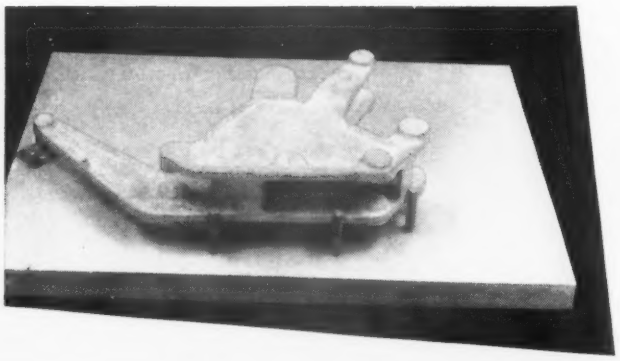
This checking fixture weighs less

because it's made of Alcoa Aluminum Tool & Jig Plate. Many manufacturers are turning to lightweight Alcoa Plate—fully normalized, machined both sides and costing less than ½ the price of other types.



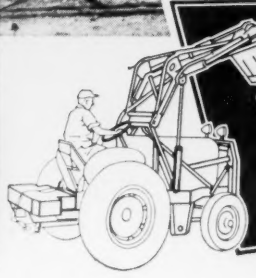
Alcoa Aluminum Tool & Jig Plate is a cast product. It is available from stock in thicknesses of ⅜″ to 4″—in any dimensions up to 48″ x 96″. Tolerances of ±.010″ are held on thicknesses. For full information on Alcoa Tool & Jig Plate, contact your local Alcoa sales office . . . or write Aluminum Company of America, 1949-K Alcoa Building, Pittsburgh 19, Pa.



Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

Shoveloader gives you *more efficient* BULK MATERIAL HANDLING *for only $2332*



Prices for 3/8 yard Shoveloader start at $2332 (f.o.b. factory) for complete unit including tractor.

This versatile low-cost handling and maintenance tool does so many things so efficiently that practically every industrial plant will find it a profitable investment.

- If you handle bulk material such as dry chemicals, sand, limestone, coal, etc., the Lull Shoveloader will save money for you from the day it is installed.
- It will charge hoppers, load trucks, keep stockpiles orderly.
- It will carry coal from yard storage to power station and haul away ashes.
- It can handle heavy loads of loose castings, forgings or other parts in yard or plant.
- If you require grading, landscaping, backfilling or yard clean-up work, the Shoveloader will do that, too.
- It will be a godsend next winter when your storage yard, parking lot, driveways and sidewalks must be cleaned after a heavy snowfall.

The Lull Shoveloader will out-perform similar units that cost much more. Features include greater forward reach, higher lift, power down-crowd, full hydraulic control of bucket, sturdy bridge type construction. Bulldozers, cranes, snow-buckets, forks or sweeper attachments are easily added.

write for Bulletin AD-32-B or contact your Baker-Lull distributor for complete information.

THE BAKER-LULL CORPORATION

Formerly the Lull Manufacturing Company

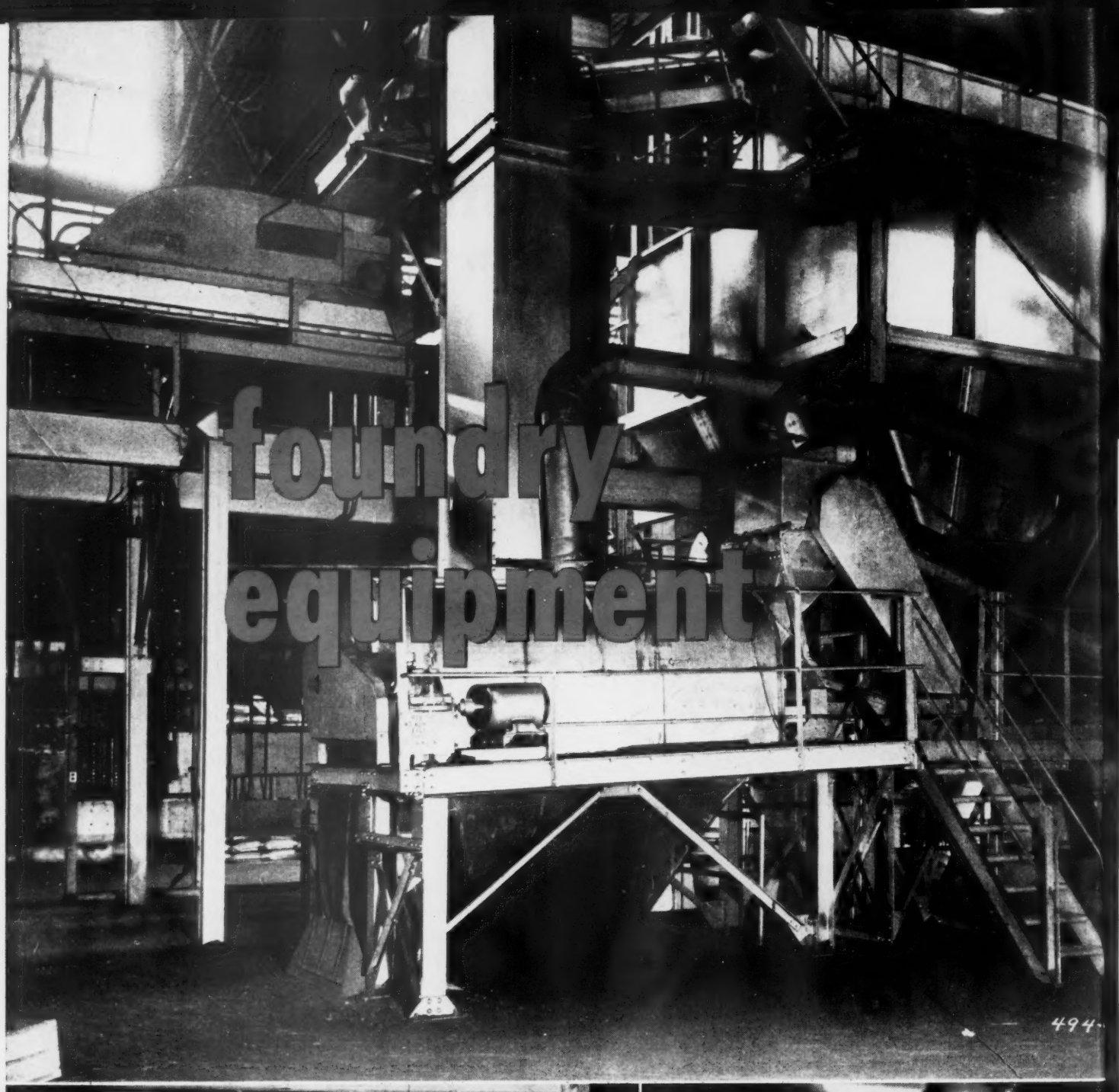
325 WEST 90th STREET • MINNEAPOLIS 20, MINN.

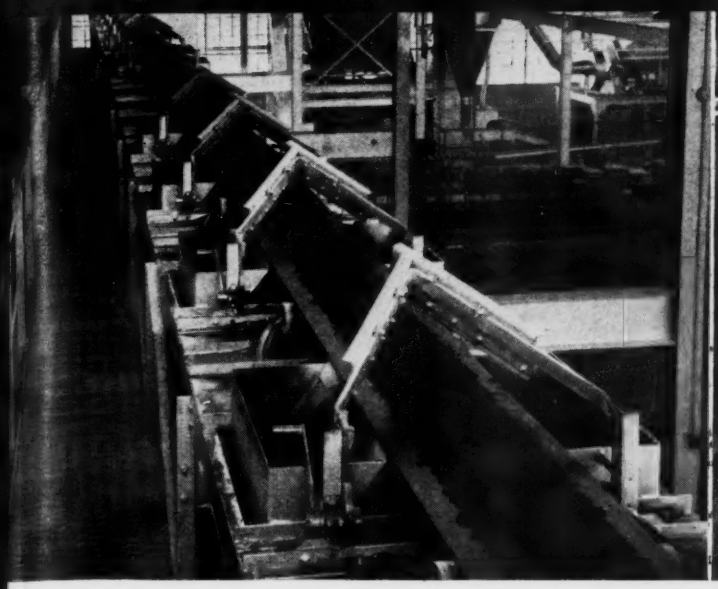
A Subsidiary of the Baker-Raulang Co., Cleveland 2, Ohio

Baker Lull

handling equipment

foundry equipment





COMPLETE HANDLING SYSTEMS

for SAND... MOLDS... CASTINGS... COKE

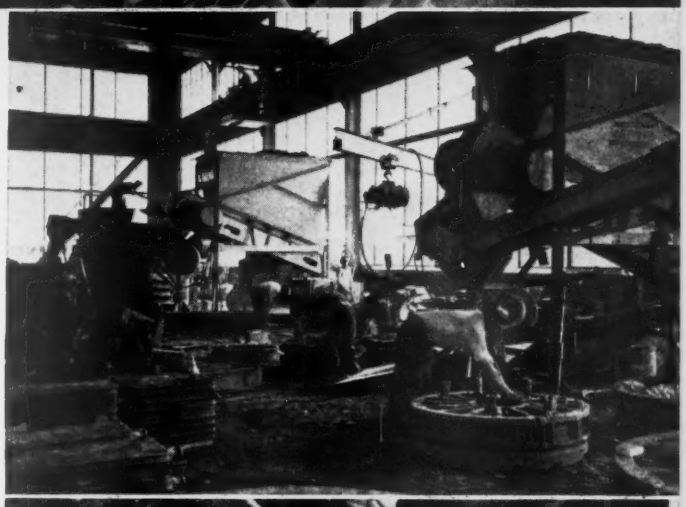
APRON AND BELT CONVEYORS

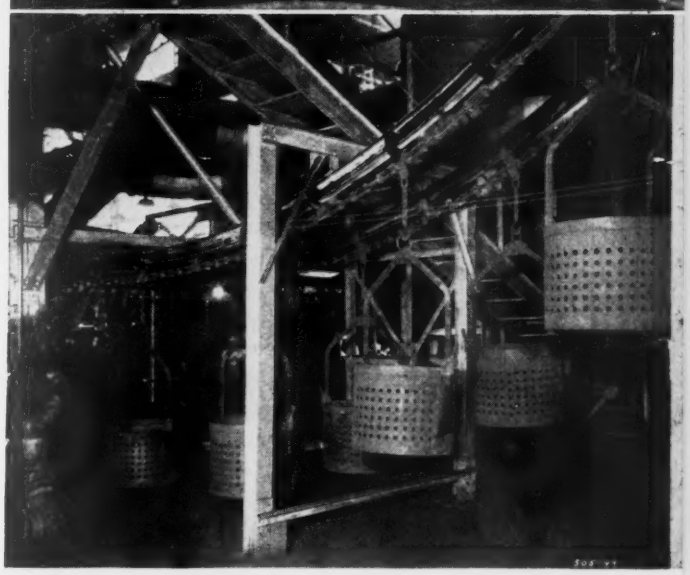
AERATORS — BLENDERS
CLEANARATORS
CRUSHERS
BUCKET ELEVATORS
DISINTEGRATORS
FEEDERS
FLASK FILLERS
MOLD CONVEYORS
PADDLE MIXERS
ROTARY SCREENS
SANDITIONERS
CHAINS

Includes Survey Study and Preparation of Equipment Layouts

Send for our New Catalog No. 845

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. FEMA





JEFFREY

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

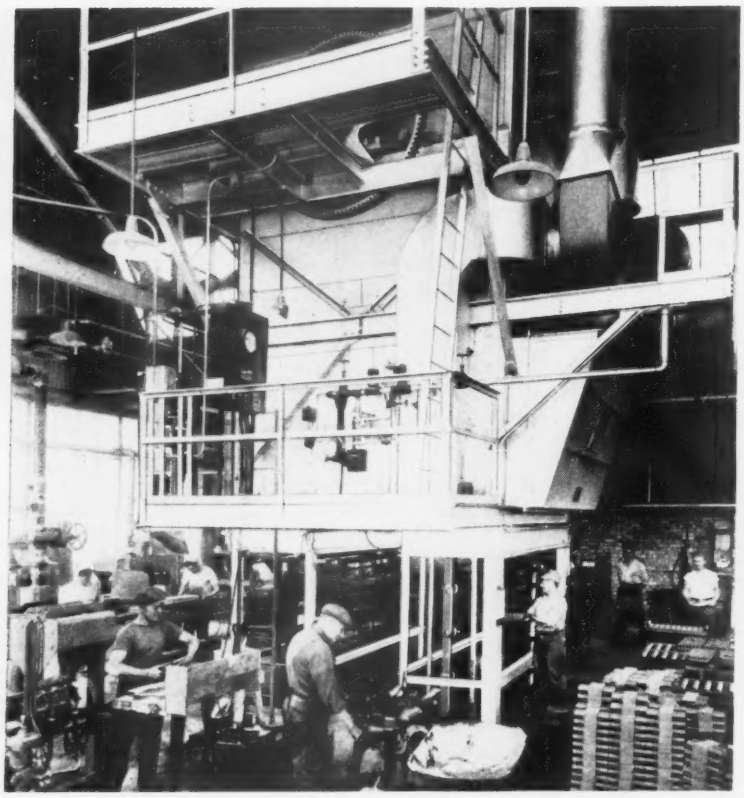
PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED
. . . IT'S A JOB FOR JEFFREY!

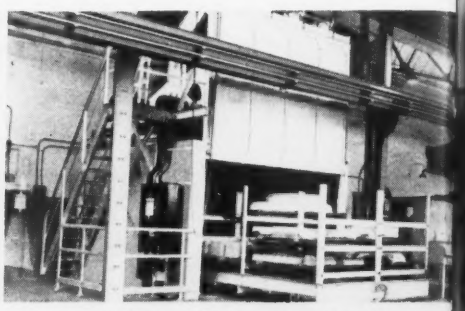
Repeat orders for

COLEMAN OVENS

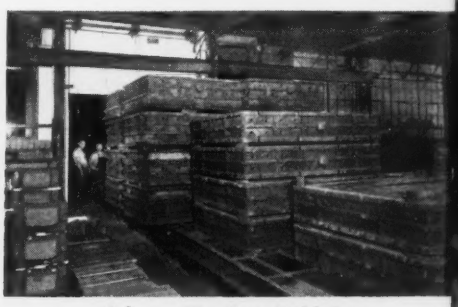
prove outstanding performance



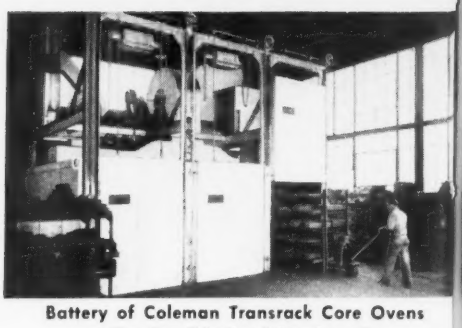
Coleman Tower Oven at Wells Manufacturing Co.



Coleman Car-Type Core Ovens
at Pettibone-Mulliken Co.



Coleman Car-Type Mold Oven
at The Bullard Co.



Battery of Coleman Transrack Core Ovens
at The Crucible Steel Castings Co.

You should get all the facts concerning the core and mold ovens you expect to install... because the right ovens will increase your production and your profits. Over 80% of Coleman Ovens are "repeat orders" from past customers... proving performance to *complete satisfaction.* Coleman Ovens are the choice of leading firms in every branch of the foundry industry from small shops to large production foundries. You get over 50 years of know-how and experience in every Coleman Oven, so why gamble with inferior designs? Coleman Ovens of proved performance cost no more... and pay for themselves quickly out of savings in fuel, labor and increased production. Get the facts today...

WRITE FOR BULLETIN C

A COMPLETE RANGE OF TYPES AND SIZES
for every core baking and mold drying requirement:

- Tower Ovens
- Horizontal Conveyor Ovens
- Car-Type Ovens
- Transrack Ovens
- Rolling Drawer Ovens
- Portable Core Ovens
- Portable Mold Dryers

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

THE FOUNDRY EQUIPMENT COMPANY
1831 COLUMBUS ROAD CLEVELAND 13, OHIO

● *world's oldest and largest foundry oven specialists*

MECHANIZE MATERIALS HANDLING

WITHOUT COSTLY INSTALLATIONS OR LOSS OF PRODUCTIVE TIME

use an Allis-Chalmers HD-5G and Tracto-Shovel Attachments

You speed materials handling "right now" when you put this fast-working tractor-shovel combination on the job. The HD-5G starts boosting production without waiting for costly installations or changes in plant layout. Digs into the toughest jobs, indoors or out . . . lifts, loads, excavates, pushes, tows...handles all materials, bulk, solid or packaged.

And it works easily in close quarters — turns in its tracks . . . has no bulky, overhead structure. Outdoors, the track-type tractor is not bothered by weather or ground conditions . . . works the year around, even in unpaved yards.

Choice of thirteen interchangeable Tracto-Shovel attachments makes the HD-5G a one-tractor material handling fleet. Special buckets, lift fork, crane hook, rock fork, 'dozer blades and others may be interchanged in a few minutes with simple tools.

Write for descriptive literature on the full line of Tracto-Shovels from 1 to 4 cu. yd.

LIFT FORK ATTACHMENT
Stacking Height (under forks) - - 106 in.
Lifting Capacity - - - - - 4,000 lb.

CRANE HOOK
Lifting Height (hook to ground) - - 138 in.
Lifting Capacity - - - - 5,000 lb.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HD-5G THE MODERN TRACTOR IN EVERY WAY
Designed For Your Job • Built To Take It • Easy To Service
Easy To Operate
40.26 drawbar hp. • 1 cu. yd. bucket
Dumping height — 9 ft., ¼ in.

NOW...

Sander Discs by CARBORUNDUM®

Packaged to save you time and money *on the job*...and in the *storeroom!*

Fast-cutting, long-life CARBORUNDUM Brand Sander Discs now bring you extra savings—give you *more for your dollar!* Here are the reasons:

NO BALING TO DAMAGE DISCS
No straps to damage disc edges—or to weaken the fibre by pressure-forcing grain into backing.

MOISTURE-RESISTANT SEALED PACKAGE
Maintains proper moisture content in each disc to give you top performance in use. Keeps out excess humidity in transit and storage.

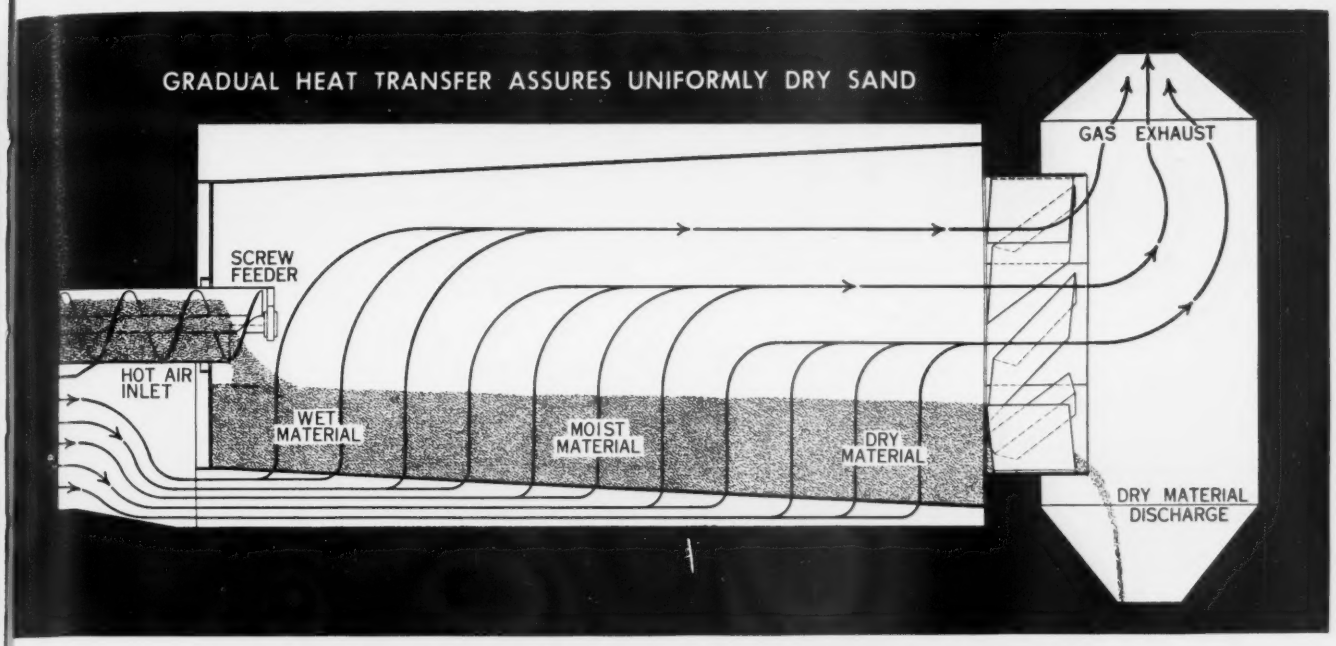
EASIER TO OPEN...EASIER TO STORE
No wire cutters needed. Boxes stack easily and square on shelves or pallets. Why put up with lop-sided stacking of bales—with loose unbaled discs—with hard-to-see labels? They all slow down production...waste labor...cost money.

CALL YOUR CARBORUNDUM DISTRIBUTOR or salesman today. He offers a complete line of sander discs for every sanding job. He'll gladly help you select the right combination of discs and sander pads to save time and money on the production line...and in handling and storage. You'll find him listed in the yellow pages under "Abrasives" or "Grinding Wheels." Or, if you prefer, write to The Carborundum Company, Dept. F 82-325, Niagara Falls, New York.

CARBORUNDUM

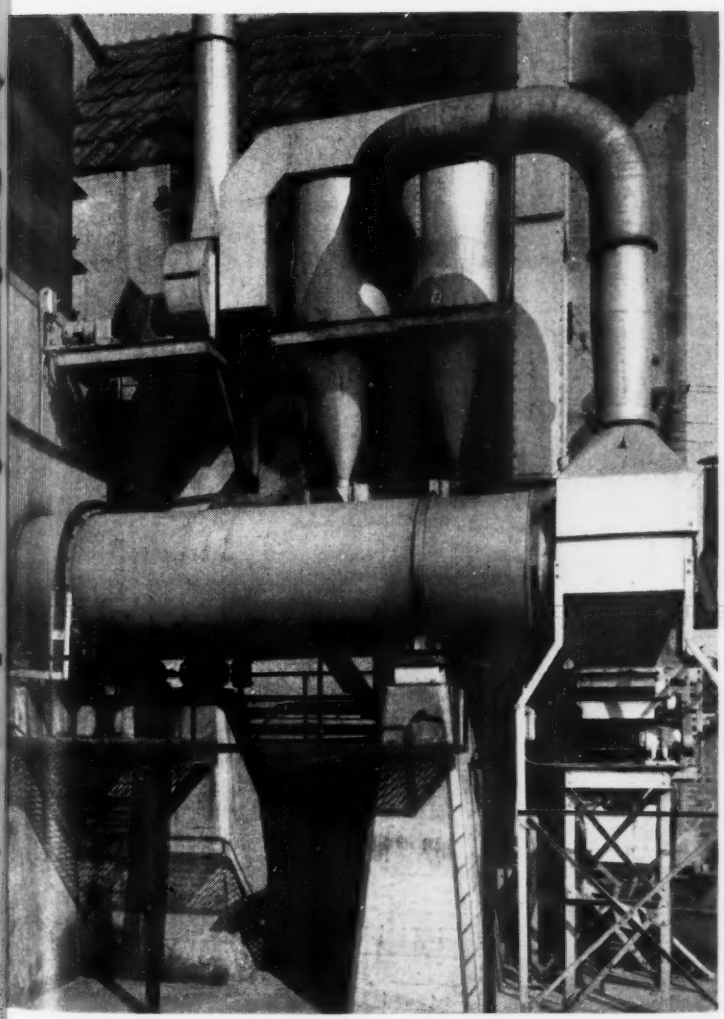
REGISTERED TRADE MARK

...continually putting more cents in your abrasive dollar!



Gentle rolling action over slowly revolving louvres results in uniform treatment, thereby eliminating spotty over- or under-drying. Gradual drying of sand, as it progresses through the Roto-Louvre Dryer, affords a uniform moisture content of the product at a low final temperature.

Dry sand means better castings



At a Detroit automotive foundry, Link-Belt Roto-Louvre Dryer reduces moisture content of 10 tons of sand per hour from 6.0% to 0.5%.

Space-saving LINK-BELT Roto-Louvre Dryer delivers large volumes of dry sand... at cool discharge temperatures

For uniform mixing, core and molding sands must be dry. And the sand must also be cool enough to blend properly with core oil. On both counts, Link-Belt Roto-Louvre Dryers offer unique advantages.

Sand is delivered with a uniform moisture content of 0.5% and at a uniformly low discharge temperature. Equally important, Roto-Louvre does this without the assistance of an extra cooler . . . requires only half as much floor space as other drying equipment.

Link-Belt builds eight sizes of Roto-Louvre Dryers—in capacities from 1 to 60 tons per hour. Get complete information from the Link-Belt office near you, or write direct for new Book 1911-B.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

LINK-BELT

HANDLING and SAND PREPARATION MACHINERY

LINK-BELT COMPANY Plants: Chicago, Indianapolis, Philadelphia, Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities. 12.949

STR

This is Bushman, for 20 years prior to his death, one of the best known and most popular civic figures in Chicago. A native of French West Africa, Bushman was 6 feet 2 inches tall and weighed as much as 550 pounds. Despite his ferocious looks, he was a kindly, jovial gorilla. But, because of his tremendous strength, his keeper had not entered his cage for over 10 years.

RENGTH

Certainly among the mightiest of all animals is the male gorilla, native of the forest regions of West Africa. Broad, powerful shoulders and long, muscular arms give him an enormous strength that is highly respected throughout the jungle.

HINES FLASKS, too, are noted for their strength. Fixture-built to extreme accuracy, reinforced at the parting line and buttressed with diagonal ribs—they're built to outperform and outlast any other flask on the market. They give better, longer service simply because they're made better and stronger than other flasks. HINES "Pop-Off" Flasks last longer, too, because hammering isn't necessary for removal—just move the levers and off they come.

Yes, if it's strength you need in flasks, you can depend on HINES FLASKS to provide it.

HINES *flasks*

HINES POP-OFF FLASK

THE HINES FLASK CO.,

3431 WEST 140TH STREET, CLEVELAND 11, OHIO • TELEPHONE: ORCHARD 1-2806

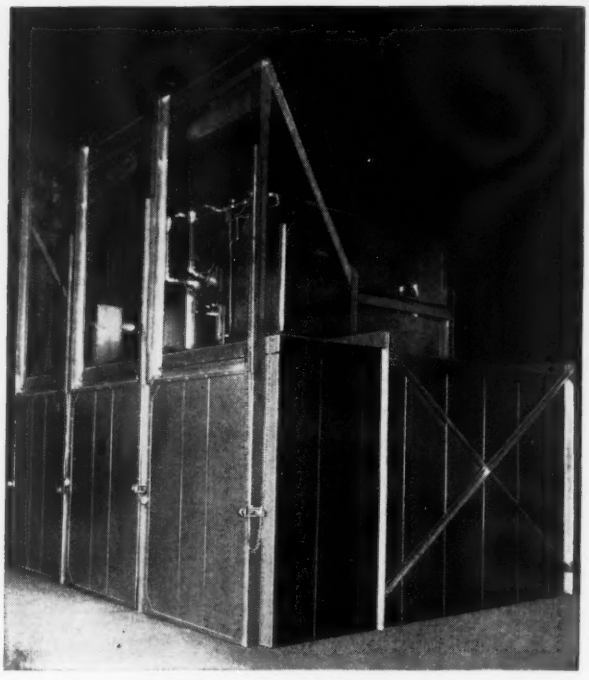
District Photo

A LOT MORE THAN FANS DUCTS, HEATERS AND PANELS GO INTO . . .

LANLY FOUNDRY OVENS

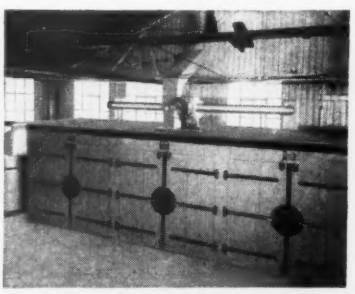
The proper adaptation and utilization of the essential component parts in every LANLY OVEN for maximum operating efficiency and economy, is a certainty being proved every day in foundries throughout the country. Specialized knowledge evolved from long experience and close cooperation with our customers enables us to design and erect better foundry ovens.

Upon receipt of information covering your needs, we will submit a proposal for an oven that will be thoroughly guaranteed as to construction and performance.



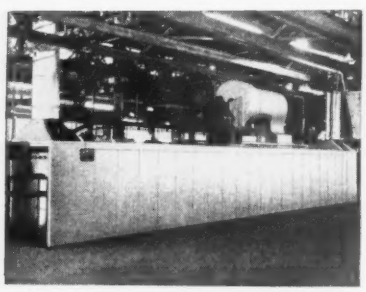
3 COMPARTMENT RACK TYPE OVEN

Uniformally heated by one compact, high capacity, air heater serving all compartments. Each compartment accommodates two core racks 4'-0" wide x 7'-0" long x 6'-0" high, loaded end to end.

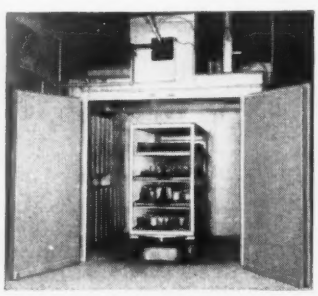


Three Compartment Rack Type Oven

Lanly Car Type Oven

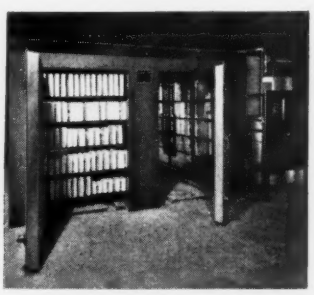


Continuous Core Blacking Oven



De-waxing Oven

Combination Rack and Drawer Type Oven



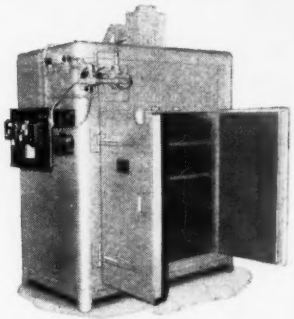
Plaster Mold Drying Oven

LANLY FOUNDRY OVENS

THE LANLY COMPANY • 780 PROSPECT AVE

CLEVELAND, OHIO

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION



Shelf Type Core Oven

Answers to Shakeout Problems

How to Select the Right Unit . . . Decide for yourself. The new bulletin (illustrated at right) shows how to choose the best unit for the job, how to decide on deck openings, layout, motor, etc.

How to Reduce Installation Costs . . . You can avoid heavy, massive foundations. Installation of a *Foundromatic* shakeout is easy. Low headroom requirement allows plenty of room for sand removal system.

How to Cut Maintenance . . . Simplified *Foundromatic* shakeout design has fewer parts. Construction is unusually rugged. Less time is required for shaking out.

Get your copy of this helpful bulletin. Ask your nearby Allis-Chalmers office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for "*Foundromatic* Shakeouts," Bulletin 07B6365B. A-4163

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Foundry Equipment for Bigger Output—Better Working Conditions!

Vibrating Screens

Cupola Blowers

Motors-Drives Control

Foundromatic Core Dryer

Induction Heating & Melting

Regulex Arc Furnace Control

New design caster gets greater strength, easier maintenance with TIMKEN® bearings

GREATER structural strength—more than enough to carry with ease 13,000 lb. castings like the one shown on the dolly. And all because Midwest Precision Corporation designed its new "Loadmaster" casters around Timken® tapered roller bearings.

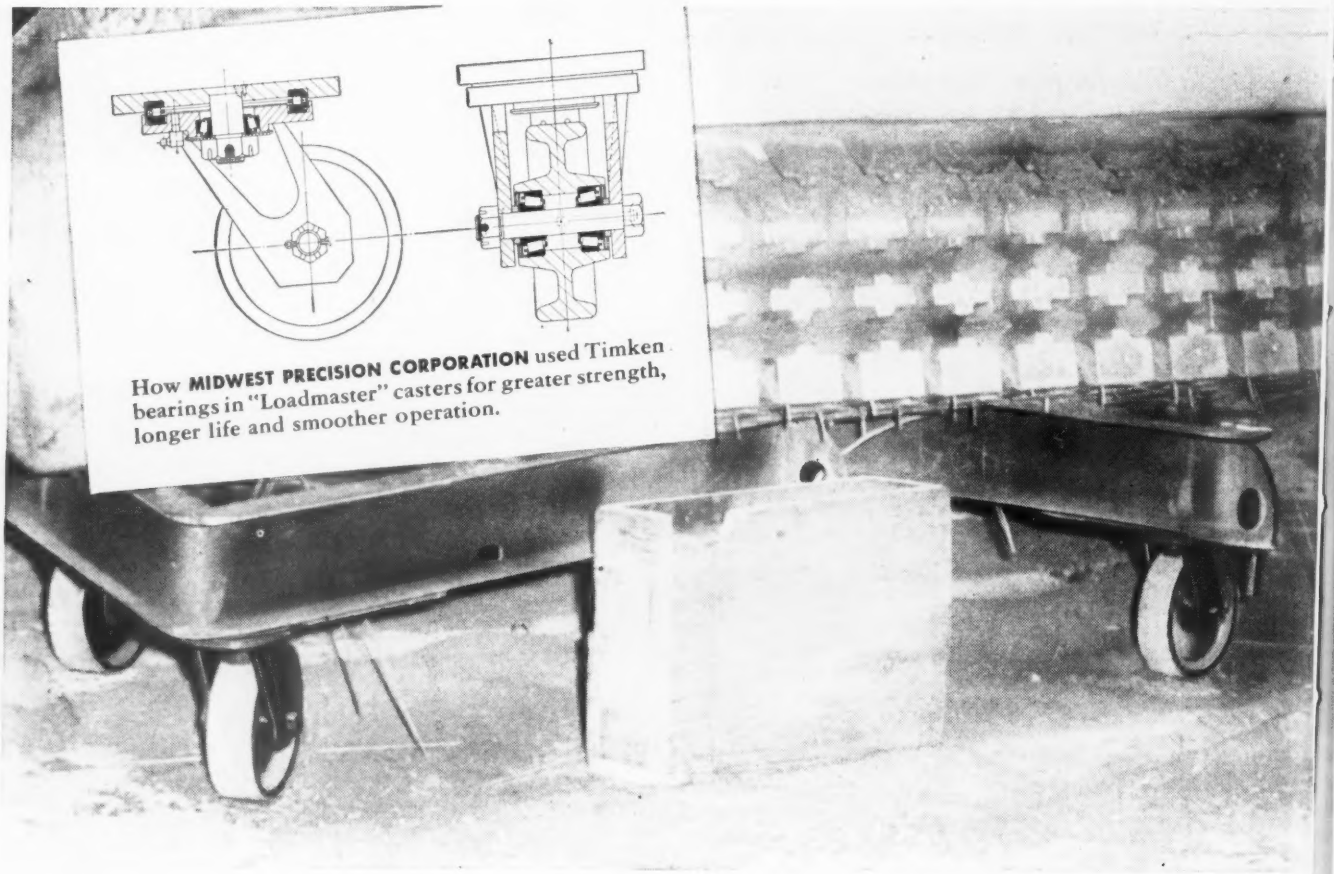
The large diameter of the Timken thrust bearing used in the "Loadmaster" lets it withstand more torque, more shock, more thrust than conventional ball-race casters. And because a Timken thrust bearing is a self-contained unit, wear on the top plate of the caster assembly is permanently eliminated. Should it ever become necessary, the bearing can be replaced in just the time it takes to remove the top plate alone!

In addition to the Timken thrust bearing, other Timken tapered roller bearings are used as a pivot, and in the wheel. See diagram below.

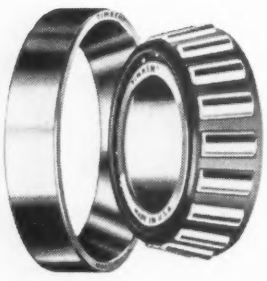
One reason for the extra load-carrying capacity of Timken bearings is the full line contact between rollers and races. Their on-apex tapered construction gives Timken bearings true rolling motion. And their incredibly smooth surface finish practically eliminates friction—that's why "Loadmaster" casters have exceptionally low friction ratings.

To get all these advantages in the machines you build or buy, always make sure they're equipped with Timken bearings. Look for the trademark "Timken". It's stamped on every bearing! The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



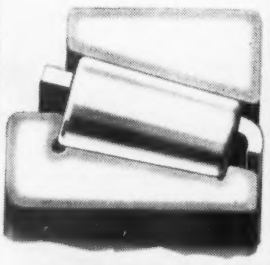
How **MIDWEST PRECISION CORPORATION** used Timken bearings in "Loadmaster" casters for greater strength, longer life and smoother operation.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



HARD ON THE OUTSIDE, TOUGH ON THE INSIDE

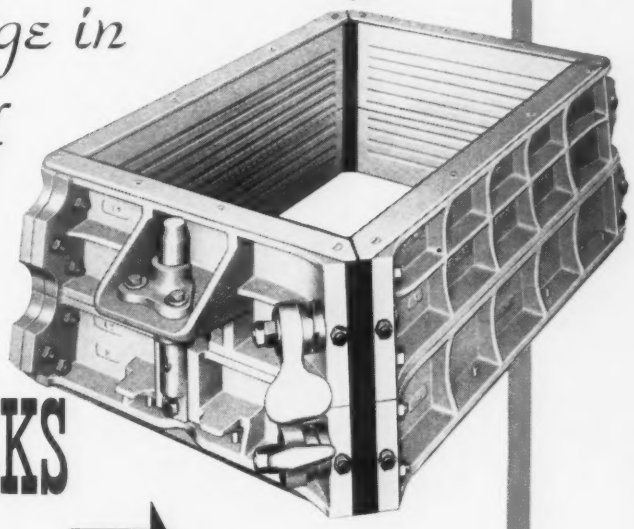
Rollers and races of Timken bearings are case-carburized to give a hard, wear-resisting surface and a tough, shock-resisting core. Result: longer bearing life.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◐ AND THRUST ◐ LOADS OR ANY COMBINATION

No Sand Can Lodge in Open Corners of

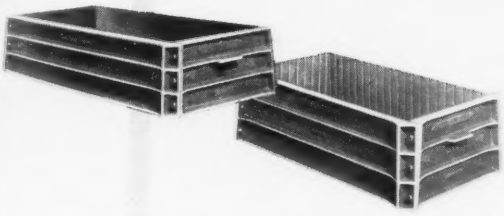
FREMONT SPREADLOCK FLASKS



—the corner gaps are completely closed by long-life, easily replaceable, live rubber corner inserts.

That's just one of the many reasons for the popularity of this new flask. Made of magnesium, which has twice the tensile strength of aluminum, they afford much longer service. Furthermore, magnesium weighs ⅓ less than aluminum, so they are easier to handle.

But more importantly, the accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure more exacting work.



Start Saving Money with FREMONT CAST IRON OR CAST ALUMINUM JACKETS

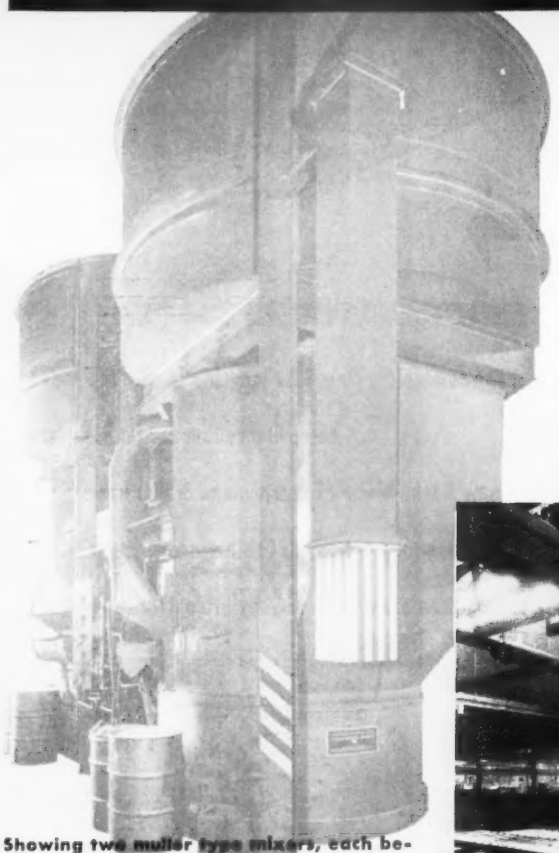
New sides or ends may be easily inserted because of the precision machined and drilled, bolted corner construction. It is no longer necessary to scrap entire jackets. The standard style is designed for ordinary foundry practice, while the grooved style, which permits ready gas escape, is ideal for steel foundries. Flasks and jackets can be assembled on 3°, 4° or 5° taper.

THE FREMONT FLASK CO.
Fremont, Ohio

Write today for free literature and prices on Fremont Spreadlock Flasks, Fremont Standard Slip Flasks (with the GROOV-LOCK FOOLPROOF PIN,) and Fremont Cast Iron or Cast Aluminum Jackets. All orders given prompt attention.

NEWAYGO sand handling equipment

Puts the Molder's Sand Overhead to Increase Productivity and Decrease Fatigue. Wherever progressive foundries are located, that's also where Newaygo Sand Handling and Conditioning equipment is found.

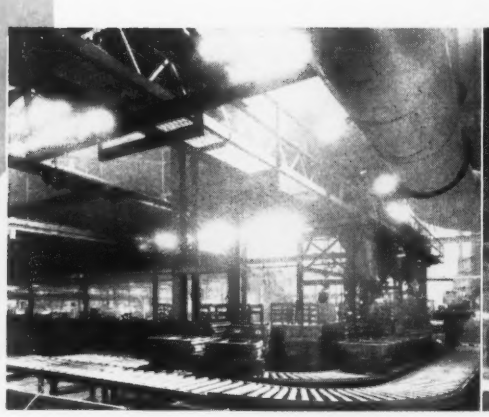


Showing two muller type mixers, each below a 50 ton capacity storage tank. One type of synthetic sand is handled although provision is made for the segregation of two types.

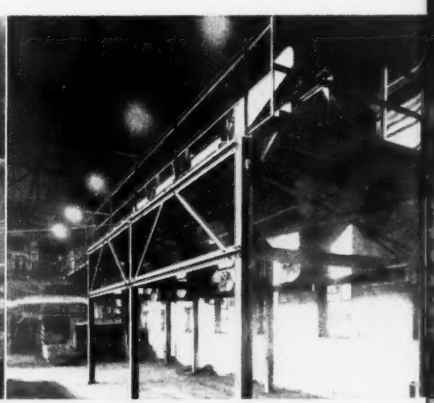
ERIE MALLEABLE IRON CO.

A 60 ton per hour capacity Newaygo sand handling system installed in this foundry has been largely responsible for a 13% reduction in man hours per ton of castings. "Large casting production has been doubled and a 10% increase in squeezer production plus other economies have been effected. Sand handling costs are lower, sand is more uniform, and facing requirements are reduced.

"Maintenance costs for the three and one-half years the unit has been in operation have been exceptionally low."



Showing how sand is fed overhead to four molding stations (two copes and two drags) under the receiving hoppers.



Four storage hoppers provide prepared sand for distribution by dump-truck and Payloader to 40 molders on conventional floors.

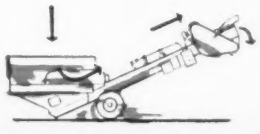
Other foundries in Erie also using Newaygo Sand Handling equipment: J. A. Zurn Co., Hayes Manufacturing Co., Albion Plant, Sitter Brass Works, Electric Materials Co.

Newaygo Sales Engineer in this area is Jack Wark, P.O. Box 2308, Hiler Branch, Kenmore 23, New York.

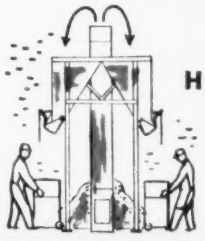
HANDY SANDY

puts sand overhead, eliminating shoveling for the molder.

REDDY SANDY



takes the hard work out of shakeout and sand preparation.



SUPER HANDY SAN

a high capacity individual-floor sand handling unit.

GOES TO ERIE

Erie, Pennsylvania, one of the largest foundry cities in the country is a good example of the wide use and acceptance of Newaygo Engineered sand handling equipment.

GENERAL ELECTRIC COMPANY'S

alleable Iron Foundry in Erie, using one Twin Hopper andy Sandy, has replaced three floor molding units aking malleable castings for locomotive and car equipent. Castings range from 50 to 150 lbs. each.

nd is fed to a central hopper by Payloaders and thence erhead where it is aerated and deposited into two overad hoppers for the molders immediate use. General ectric Company is very well pleased with the performce of this equipment and has found maintenance costs r this unit to be extremely low.

he Twin Hopper Handy Sandy operates over a jolt rockover machine making drags and over a pin lift machine making copes. The finished molds are closed and set out by an overhead crane.

proof of performance, General Electric has recently laced their order for a second Twin Hopper Handy andy for the Erie Foundries.

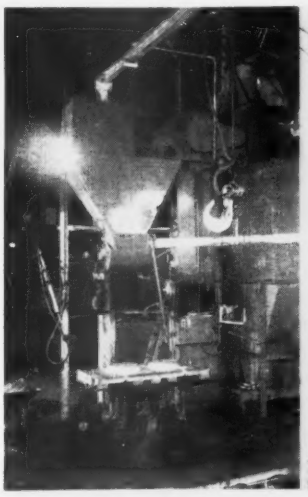
GRISWOLD FOUNDRY CO.

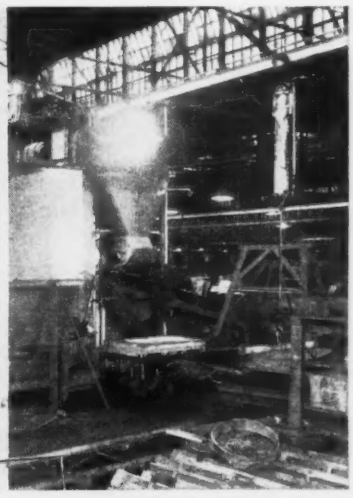
The world's largest manufacturer of cast iron cooking utensils has replaced several hand shovel floors with two Handy Sandys with a common lower feed hopper. Castings in this department are grey iron weighing from 4 to 83 lbs. per casting and demand top conditioned sand because of the thin wall structure of cooking utensil castings.

A special set-up feeds sand directly from a sand mullor to the Handy Sandy central feed hopper from which it is elevated, given additional aeration and deposited in the overhead storage hoppers ready for use at the molding stations. Sand is used at an average rate of six tons per hour. Molds are machine jolted and/or air rammed, depending upon the job, stripped, and set out on a loop conveyor.

Mr. Russell Norrell, Assistant Foundry Superintendent says, "Whereas before one man could produce 35 molds with one 20" skillet per mold each day, now two men produce 115 complete molds with 2—20" skillets per mold or a total of 230 castings with the Handy Sandy in the same time.

"On the large griddle type 36" x 19" mold, one man previously made 10 molds per day. By using the Handy Sandy, now two men produce 115 molds in one 8-hour day."



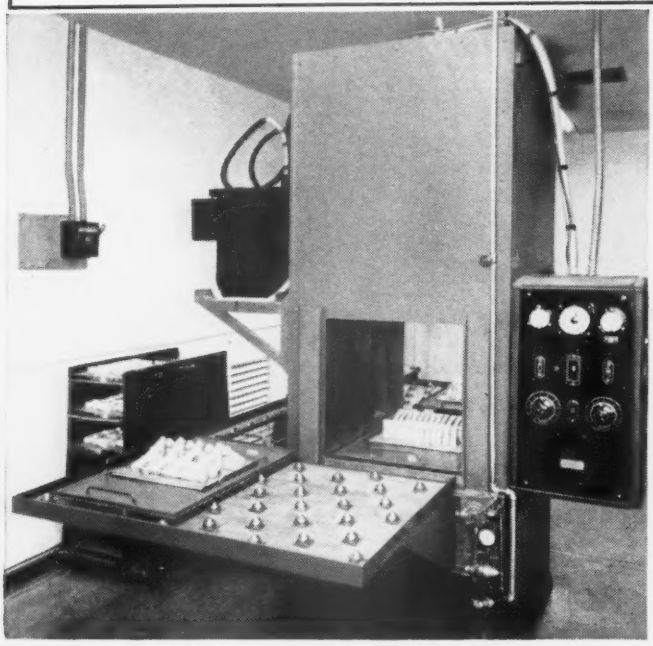


A copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire, or phone today.

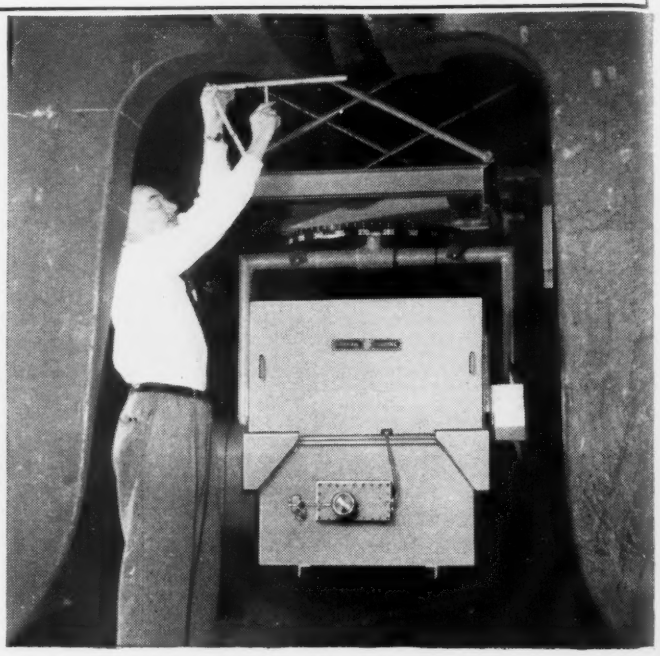
NEWAYGO | **engineering company**
NEWAYGO, MICHIGAN

Manufacturers of Noway® Mold Handling, Sand Handling and Conditioning Equipment

From aluminum castings... to battleship anchors...



Low-voltage OX-140 X-Ray Unit



High-voltage Industrial Betatron

GE builds x-ray units in 25 models to match your quality control needs

For fast, accurate, non-destructive testing and inspection — industry looks to GE X-Ray

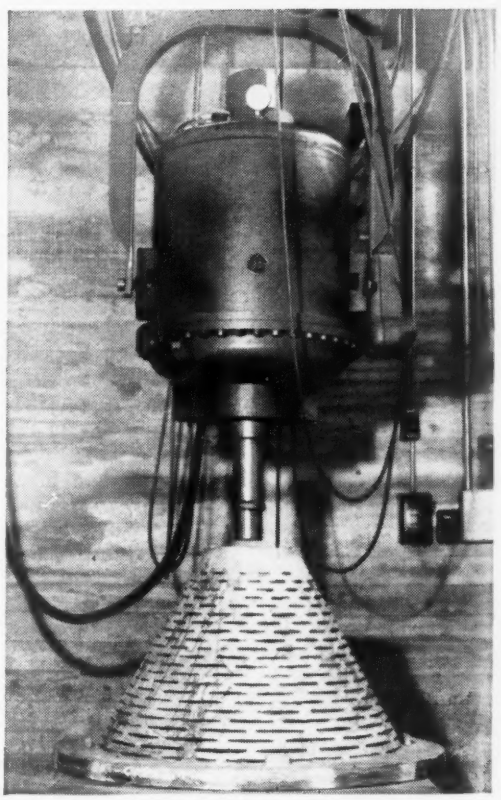
No matter what your quality control requirements — from thin sections of light metals to heavy section thicknesses of steel — there's a General Electric x-ray unit that's right for your job. Choose from units rated at 140,000, 250,000, 400,000 volts . . . 1, 2 and 15 million volts.

These compact, completely shockproof units can be yours in a wide choice of models for floor, wall or ceiling-mounting. Some are mobile, some portable . . . ready to be moved on a moment's notice to widely separated locations. Others in production-line housings are semi-automatic for continuous inspection of production lots or of raw materials.

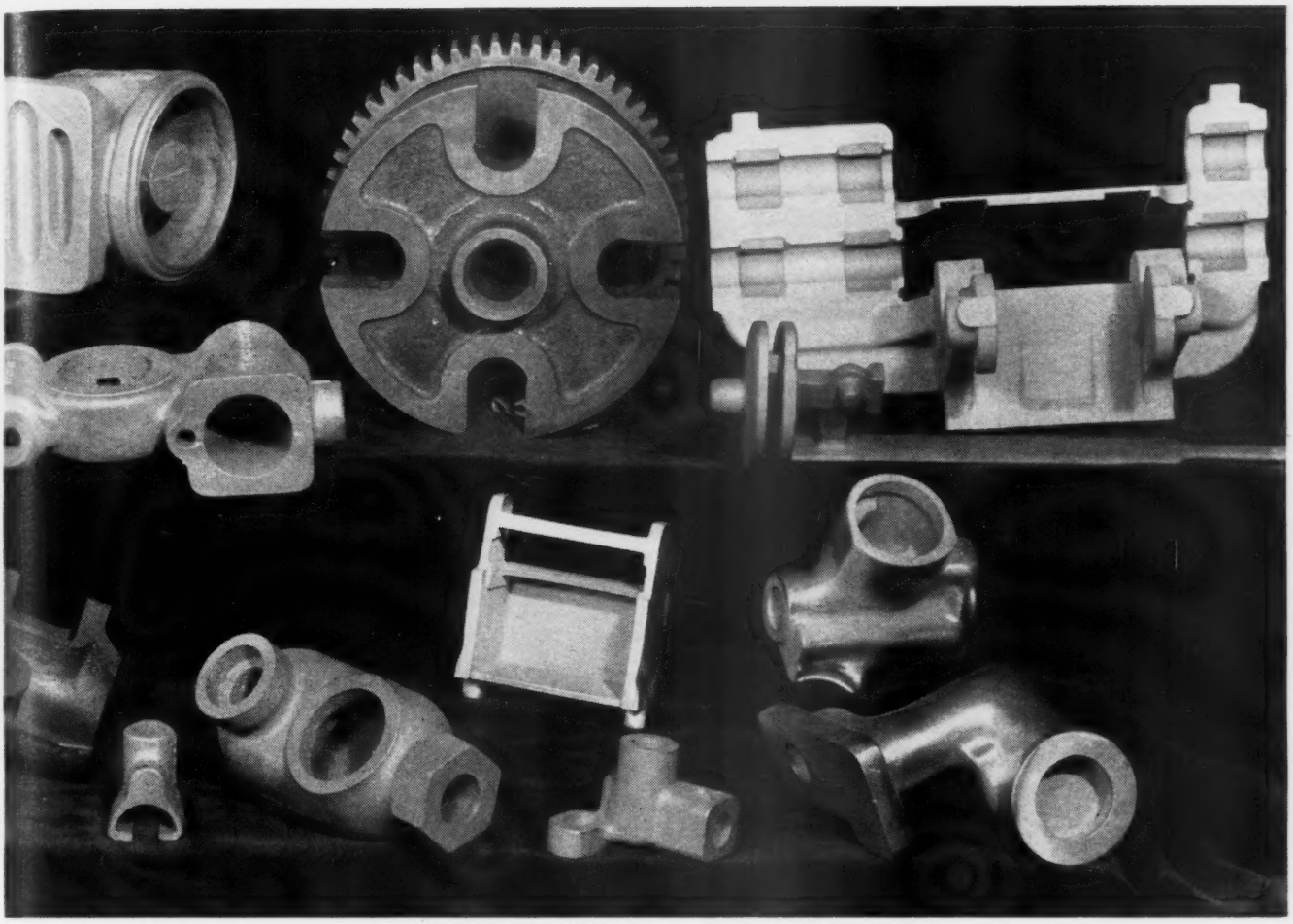
Chances are, there's a place in your manufacturing process where x-ray can lower production costs and improve quality. Let one of GE's highly trained specialists appraise your inspection needs. For complete information, write X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin, Rm. YY10.

You can put your confidence in —

GENERAL ELECTRIC



No chance for hidden defects here! Midwestern steel company uses million-volt GE Resotron for fast, accurate inspection of a complicated casting



No "Problem Pours" with Complex Cores when you use HY-TEN by HOUGHTON

As the illustration above indicates, core complexity raises no special problems when Houghton's Hy-Ten Core Oil is used for a binder.

Whether your curing cycle is fast or slow . . . core sections heavy or light . . . baking temperatures high or low . . . Hy-Ten will give you the high green strength to stoutly resist breakage or warping before and through the baking cycle. What's more, fine edges and thin sections never burn out, cores easily withstand the flow of molten metal yet shake out clean and easy. Scrap losses due to core failure are slashed to a new minimum.

Get complete information on Hy-Ten Core Oils. Write and tell us your sand type, baking time and temperature, present formula and the metal to be poured. We'll be glad to give you advice resulting from over two generations of foundry experience. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Hy-Ten Core Oils

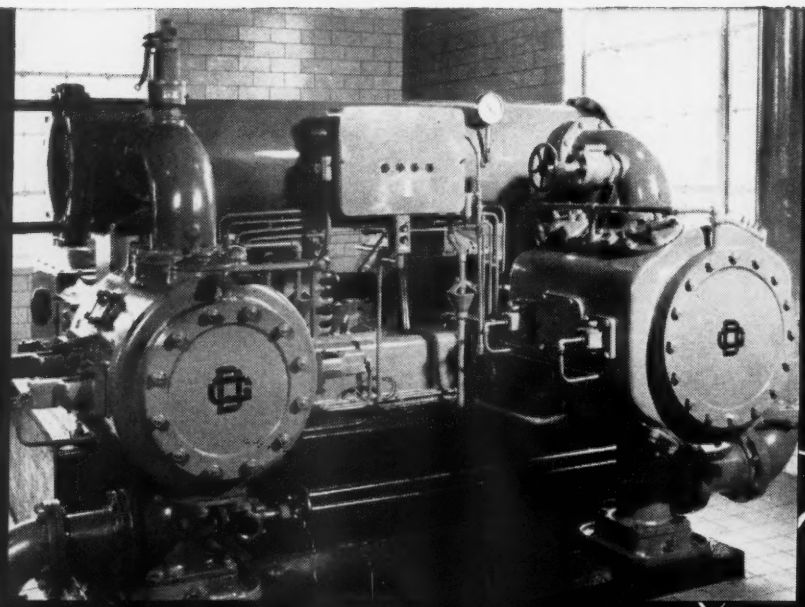
. . . products of

E. F. HOUGHTON & CO.

PHILADELPHIA • CHICAGO • DETROIT • SAN FRANCISCO

Ready to give you on-the-job service . . .

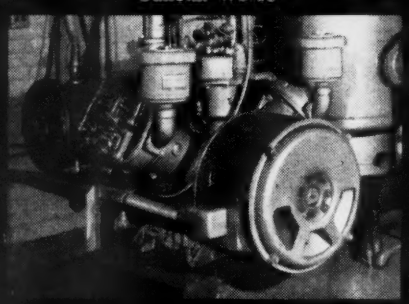
Model HA
468 to 1854 c.f.m. displacement
Bulletin HAC-36

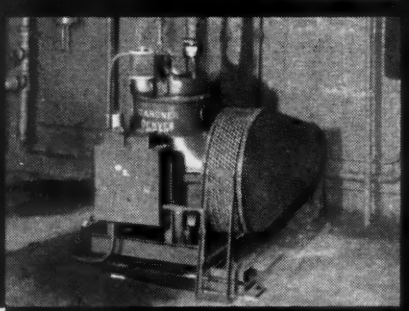


PRESSURE:	Holding up
OUTPUT:	Up to capacity
EFFICIENCY:	Right up there
OPERATION:	Downright economical
MAINTENANCE:	Trifling

For everyday compressor reports like this—
choose GARDNER-DENVER.
Write for descriptive bulletins.

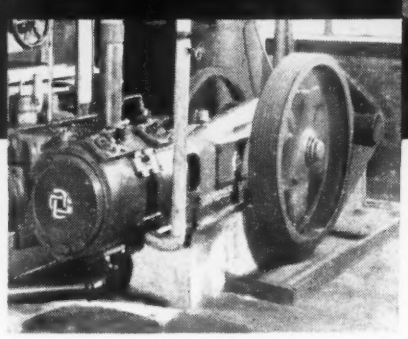
Model WB
142 to 686 c.f.m. displacement
Bulletin WB-10





Model AA
32 to 183.6 c.f.m. displacement
Bulletin AA-6

Model RX
89 to 1292 c.f.m. displacement
Bulletin HAC-40



GARDNER-DENVER SINCE 1859

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd.,
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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

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Pangborn

DISTRIBUTORS FOR

MALLEABRASIVE

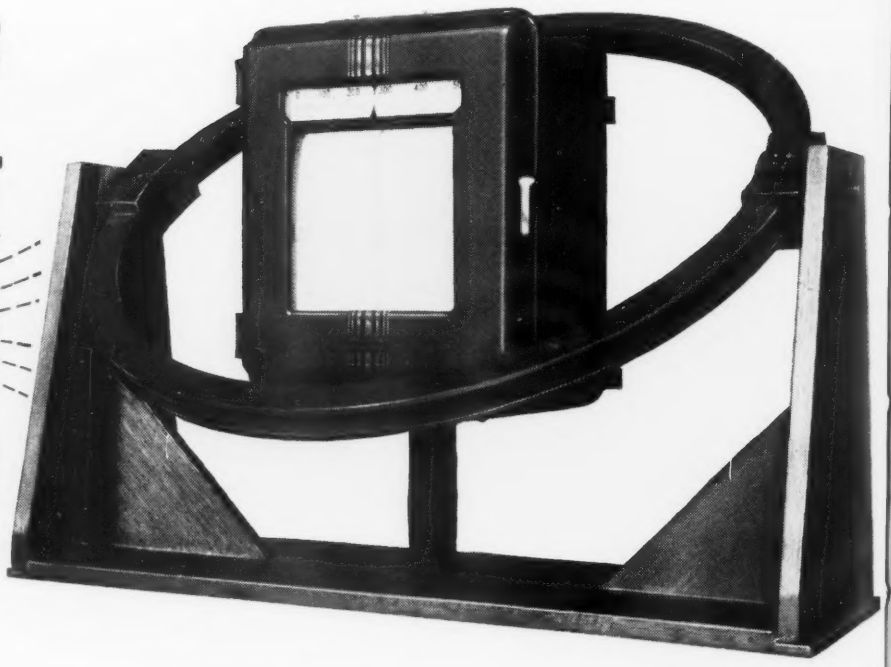
U. S. Patent #2184926
other patents pending

Next time you order abrasive, specify Malleabrasive from Pangborn Corporation, 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn BLAST CLEANS CHEAPER with the right equipment for every job

Here's how L&N engineers verify Speedomax resistance to stray electrical fields. The ring is a Helmholtz coil, adjustable for a wide variety of field effects.

Speedomax is engineered for FIELD service



• Built into every Speedomax recorder and controller is a high degree of indifference to stray electrical fields. And this is one of its most useful characteristics in almost any job. It means that you can install a Speedomax near a big motor, power line or X-Ray machine—any electrical equipment in fact—and you'll probably see no effect at all from surrounding electronic noise and "junk".

The reason for this indifference to stray fields goes back through the adjustment, building and design of the instrument, to its basic engineering. Speedomax has an *electronically-clean measuring circuit*, as well as clean signal and amplifier circuits.

This clean design includes a bifilar-effect slidewire, to eliminate any objectionable inductance at that point. It includes our "no-moving parts" trolley contact on the slidewire, which eliminates pigtails and their variable inductances. It includes use of a Mumetal slidewire shield where desirable, instead of less expensive but lower-permeability aluminum. And it includes a lot of just downright meticulous detailing, such as carefully engineered wiring and input filtering, plus ingenious shielding where required.

These and other precautions eliminate out-of-phase components in the supply to the amplifier. The latter therefore doesn't "load"; hence sends the correct amount of correct-phase power to the balancing motor. With ample power, the motor's recording and control action is snappy and accurate.

Our Catalog ND46(1) and Technical Publication ND46(1) tell the story. Write our nearest office or 4917 Stenton Avenue, Philadelphia 44, Pa.

Industry's engineers find that Speedomax instrument performance is not affected by the stray fields created by motors, electric furnaces, magnets, power lines and so on.

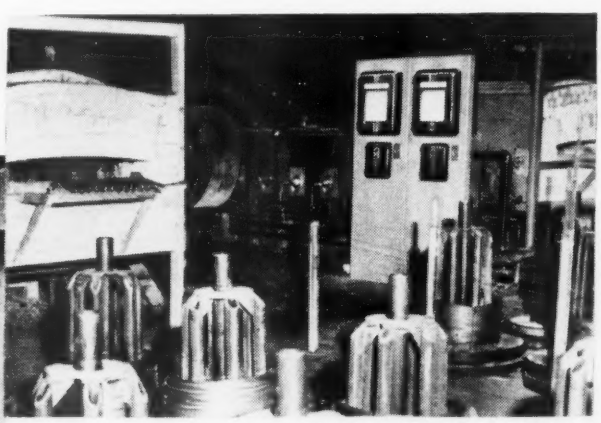


PHOTO COURTESY LACLEDE STEEL CO.

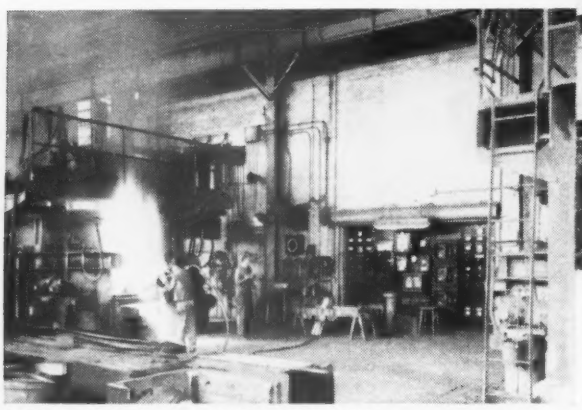


PHOTO COURTESY A CASTINGS MANUFACTURER

LEEDS NORTHRUP

instruments *automatic controls • furnaces*

Jrl Ad ND46(10)

Intricate Castings Like this call for Neville Pig Iron

TRACTOR transmission castings like the one shown above have to stand up to years of rugged service. That's why the Lynchburg Foundry Company, Lynchburg, Va., insists upon malleable pig iron that meets rigid specifications for uniform composition and high quality. To meet these requirements, Lynchburg uses *Neville* Pig Iron to cast transmission cases, flywheels, crankcases, oil pans, brake drums and other cast products. ● If your casting requirements are strict, it will pay you to specify *Neville* Pig Iron. Write, wire or phone for more facts today.

NEVILLE

Quality Pig Iron for the Foundry Trade

WaD 4808

PIG IRON DIVISION

PITTSBURGH COKE & CHEMICAL CO.

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efficient

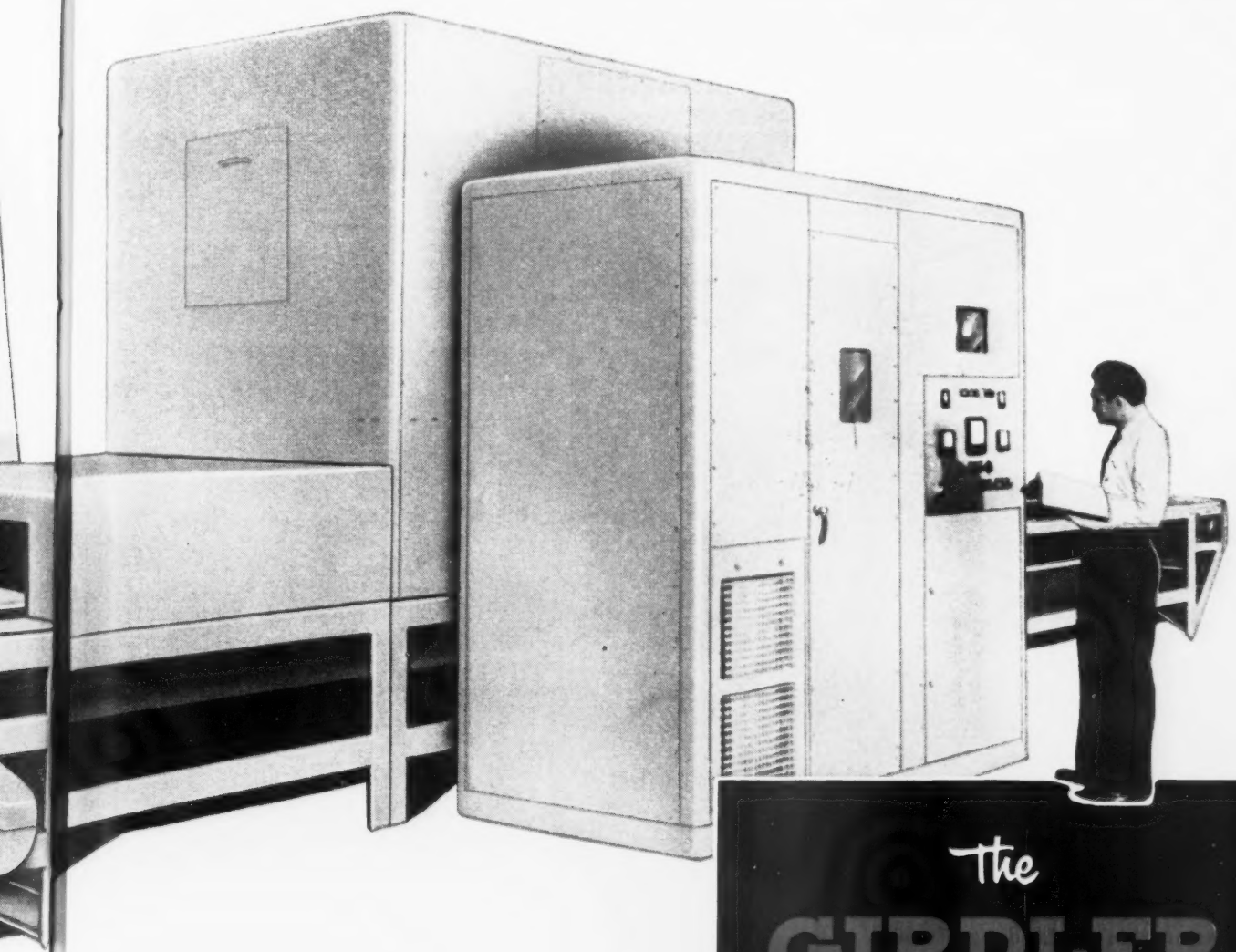
Tough Space Problem Solved And Manpower Needs Cut 50%
On-the-job facts show how foundries benefit
First Year of Operation Brings Better Than 105 Percent Return
COMPARISON
Labor & Utility Costs and Space Requirements are Reduced . . .
at Grand Haven Brass where they can double output without adding equipment
CERTIFICATION

These sample case stories from a new THERMEX booklet are based on authorized studies in leading foundries — showing greater core room yields, fewer rejects and reduced costs. THERMEX Core-baking Equipment bakes cores electronically in a *matter of minutes,* and outputs of 15 tons of sand cores per hour can be achieved.

Girdler has unmatched experience in electronic heating and baking, dating from the first industrial dielectric heating installation, which is still in daily use. Girdler has provided more installations for the foundry field than any other manufacturer, and an impressive group of companies have re-ordered THERMEX Core-baking Equipment.

Be sure that your core-baking operations are new-fashioned. Write today for THERMEX booklet T200, containing comparative cost figures for old and new methods of core-baking. The Girdler Company, Thermex Division, Louisville 1, Ky.

core-baking



The
GIRDLER
Company
(A Division of National Cylinder Gas Company)
THERMEX DIVISION

You can increase output and cut costs with...

thermex*

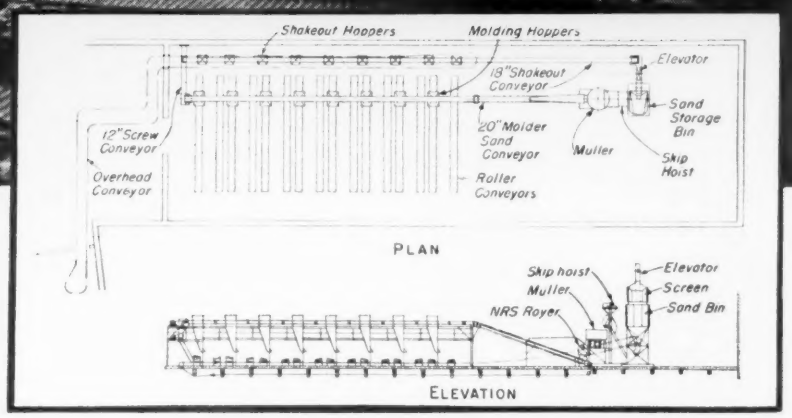
core-baking equipment

*THERMEX—Trade Mark Reg. U. S. Pat. Off.

G-W engineered materials handling

8 WAYS BETTER

FOR CHASE BRASS & COPPER CO., INCORPORATED



In the foundry operation of Waterbury Manufacturing Co. – a division of Chase Brass & Copper Co., Incorporated– Gifford-Wood has engineered eight major improvements in the handling of molding sand, molds, and castings into the new materials handling system. These improvements, brought about by the G-W system include –

1. **Consolidation of two foundry rooms into one.**
2. **Higher production through more efficient space use.**
3. **One casting method replaces two formerly used.**
4. **Virtually all manual handling has been eliminated.**
5. **Casting quality has been increased.**
6. **Working conditions are considerably better.**
7. **Maintenance costs have been reduced.**
8. **Over-all production time has been cut sharply.**

This is but one of the more recent materials handling problems solved by Gifford-Wood. For more than 140 years, G-W has designed, built, and installed similar complete systems for nearly every industry in the book. This experience is at your disposal.

A 20"-wide overhead conveyor moves molding sand past molding hoppers where operators remove it as needed by o lever-operated diverting plate. A 12" screw conveyor transfers unused sand laterally to an 18" shakeout conveyor at which point used sand collected from the molders in shakeout hoppers is added. A bucket elevator then dumps it into a storage bin from which it is skip-hoisted to a muller for mixing with new sand. After aeration and cooling it is deposited on the original belt for re-use. Roller conveyors handle molds at molding stations, and castings move to finishing on overhead monorail conveyors.

For details on this and many other G-W installations, ask for Materials Handling Catalog.

When You Think of Materials Handling—Think of

GIFFORD-WOOD CO.

Since 1814 • Hudson, New York

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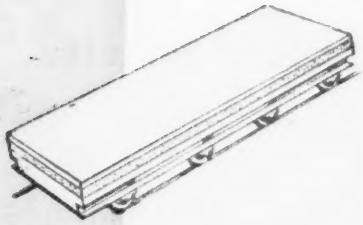
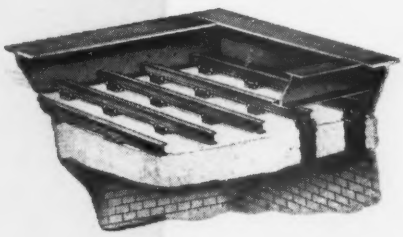
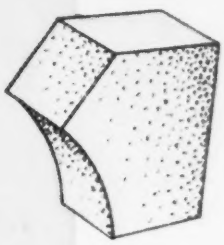
These performance records show why **B&W KAOCAST** *is a unique refractory concrete*



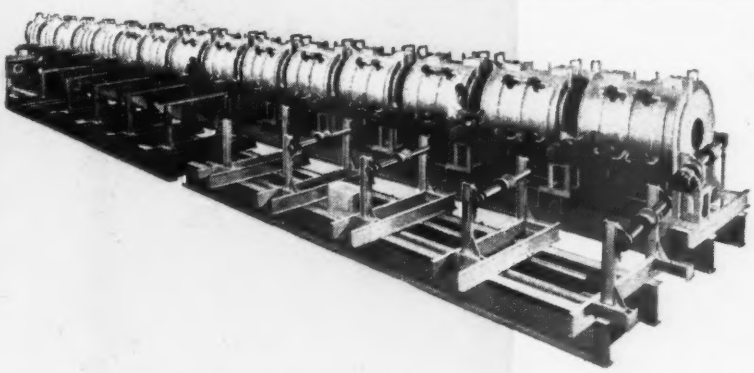
In a tunnel kiln car top, ordinary fireclay brick crumbled after a few trips . . . B&W Kaocast is still going after 400 trips without deterioration.
Another car top required maintenance after each cycle. After 8 months, B&W Kaocast was still in service . . . and required no maintenance whatsoever.



Used for soaking pit covers, B&W Kaocast reduced installation time over 30%.



Special shapes of B&W Kaocast can be cast overnight to meet production demands. Kaocast is so versatile that many maintenance engineers keep a supply on hand for miscellaneous jobs.



In a GRADIATION* normalizing furnace, B&W Kaocast cut installation costs 25-28%, including the cost of reusable forms.

*TRADE MARK

For use at temperatures up to 3000 degrees, this refractory concrete can be molded, cast directly in place or applied with a cement gun. That's the "capsule story" of B&W Kaocast . . . the versatile refractory that furnace operators are putting to work in hundreds of applications to (1) cut installation costs, (2) lengthen furnace life. • ***Ask your B&W field representative for specific data.***

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REFRACTORIES DIVISION
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9-469

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NORBIDE® Pressure Blast Nozzles

outwear any other type nozzle

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- 1500 hours steel shot or grit
- and air consumption decreased from 10 to 20 per cent
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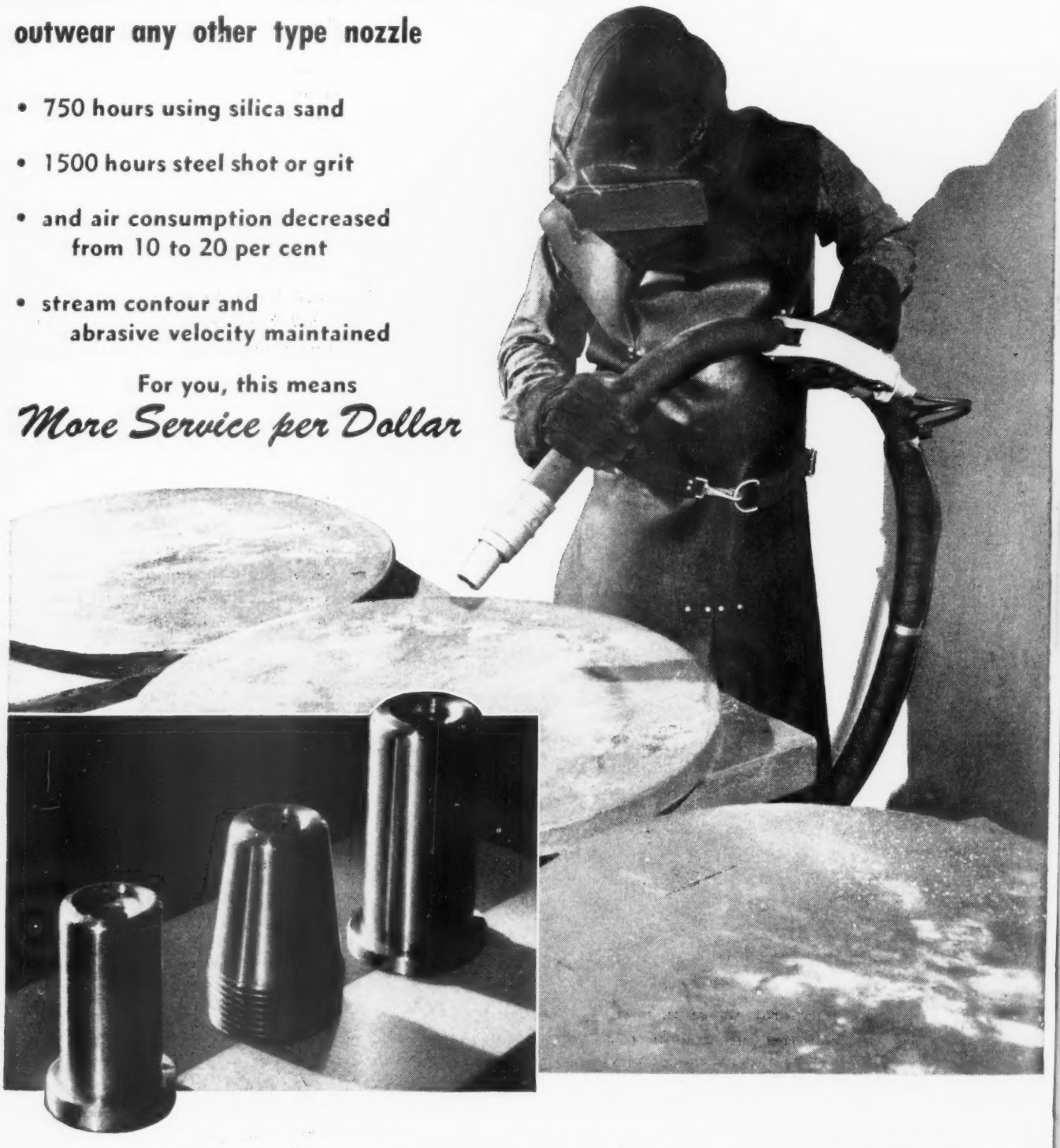
For you, this means

More Service per Dollar



Only the diamond is harder than Norbide

NORTON® COMPANY

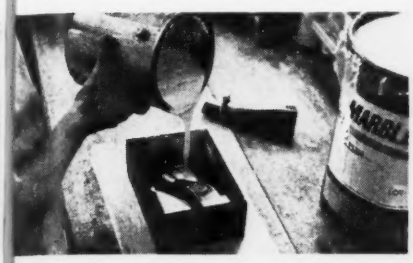
WORCESTER 6, MASSACHUSETTS

Making better products to make other products better

MARBLETTE RESIN #71 MASTERPIECE for the MASTER PATTERN MAKER

In these few, simple steps pictured below, the modern pattern maker duplicates costly master patterns, match plate parts and commercial models; gets improved molds, lowers construction and maintenance costs, reduces mold damage . . . in a word, makes this modern resin, Marblette Resin #71, one of his finest, most economical new tools.

Write today for the *Marblette Manual for Phenolic Casting Resins*—a manual for the modern pattern maker. The Marblette Corporation, Long Island City 1, N. Y

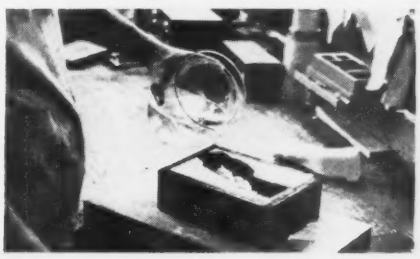


Carefully proportioned water and Plaster of Paris mixture being poured over the pattern. Flat edges of frame prevent leaking underneath.

After plaster has set just enough to retain its form, the pattern is carefully withdrawn, avoiding warping or swelling.

After sufficient drying time, the plaster mold is painted with a plastic paint to help seal poroisities and ease extraction of cured pattern.

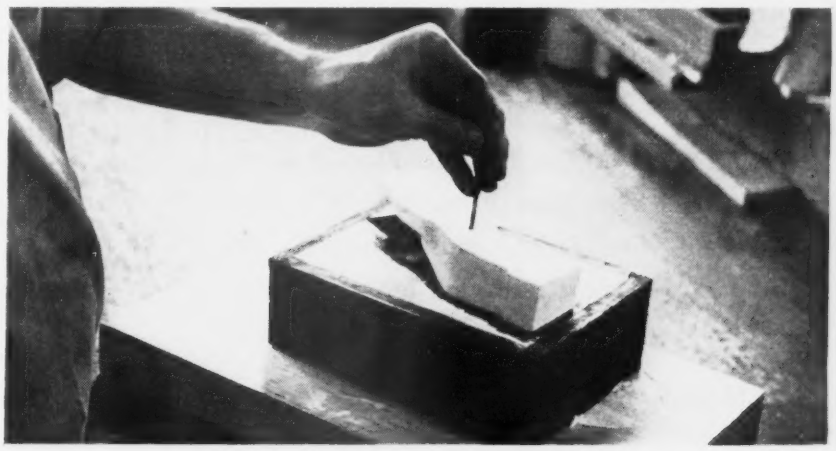
Adding the proper amount of acid hardener to the liquid resin #71 insures optimum physical properties of master pattern duplicate.

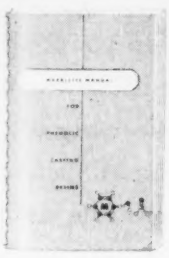


Resin-hardener mix is poured into pre-warmed mold. Prewarming lessens the time needed to cure resin in oven.

Mold filled with resin is carefully placed in oven. Small patterns will cure in about an hour at 180°F.

Final extraction of cast duplicate takes place after mold has thoroughly cooled. A wood screw eye will aid in extraction.





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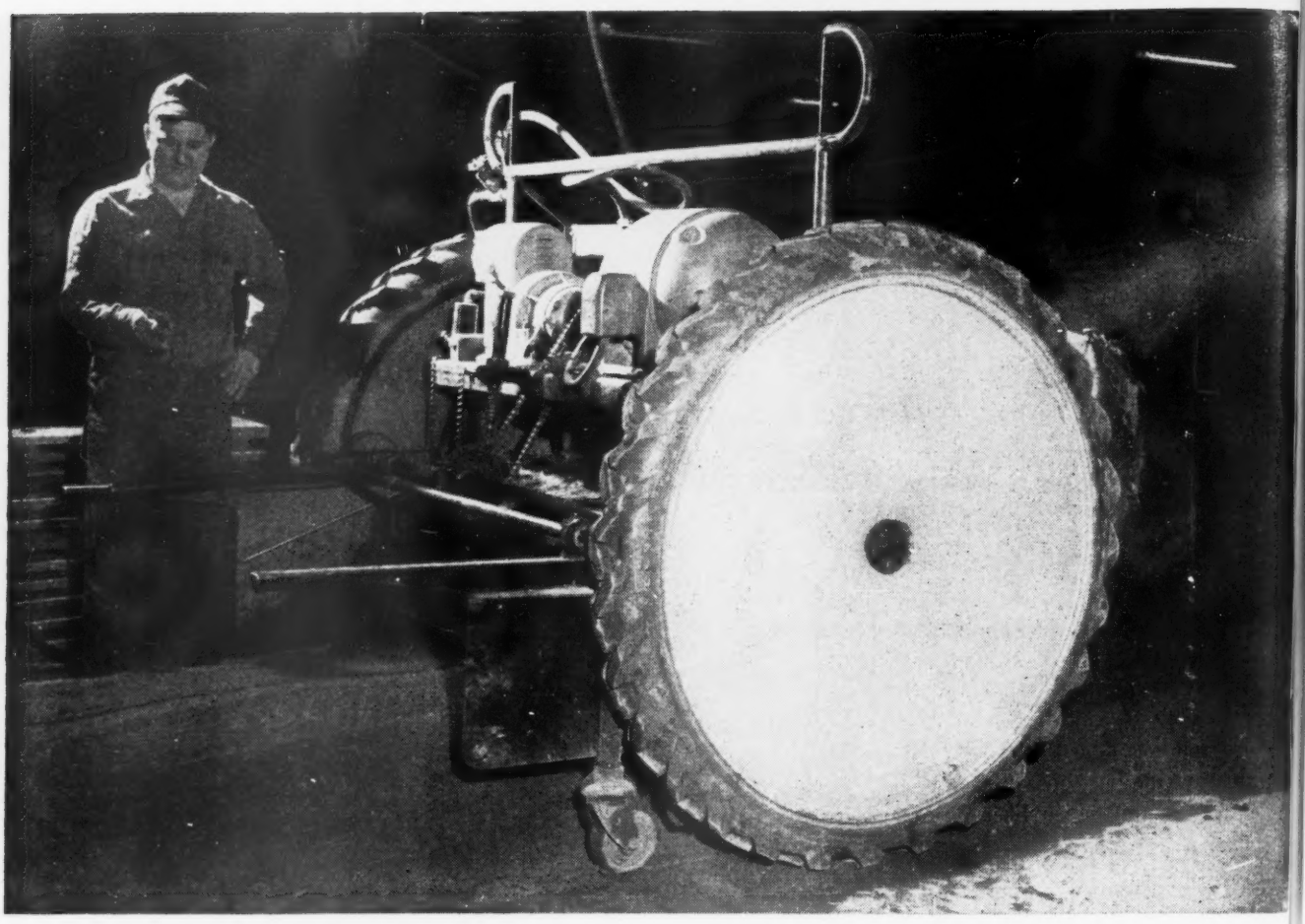
IN TUNE WITH THE TIMES

WITH *"The Moulders' Friend"*



Costs rise higher and higher every year. To keep in tune with the times we must find cheaper ways to do the job better.

Foundrymen who use The Moulders' Friend sand conditioner agree that the thousands of flat tempered steel wires in the brush revolving at high speed do the most thorough job of mixing and aerating sand heaps on the foundry floor.

The Moulders' Friend is completely self-propelled. It has a capacity of two tons of thoroughly conditioned sand per minute with travel speeds up to 50 feet per minute. One man does the job.

A screen for removing trash and tramp iron and a water dispenser for accurately wetting down the sand as the machine travels over the heap are valuable added features.

The Moulders' Friend fits your foundry. Being carried on two large wheels it turns short and handles well in the crowded foundry.

The Moulders' Friend will help you keep in tune with the times by paying for itself with better castings and less labor cost. Investigate this remarkable machine today. See one in operation. Valuable information is yours for the asking. Please write for bulletin F.

THE BRUSH DOES THE JOB

"The Moulders' Friend" ● Dallas City, Illinois

Have You a Fortune Tied Up in Dead Core Storage Space?

Free it with Allis-Chalmers Dielectric Sand Core Dryer

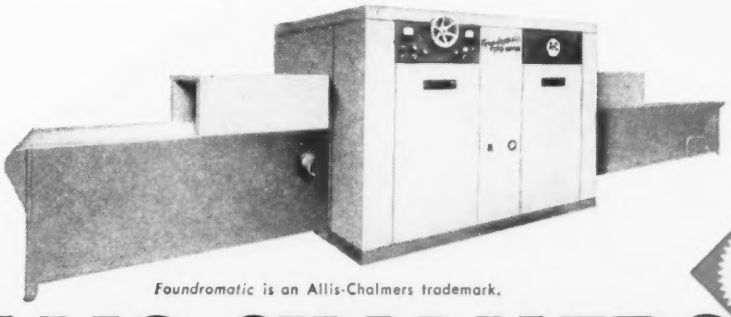
Many foundries are wasting hundreds of feet of valuable floor and shelf space by storing cores. If this is the problem in your foundry, why not eliminate it?

Make cores only as you need them with a *Foundromatic* sand core dryer. There is no necessity for storing cores when you use the *Foundromatic* dryer. Cores are dried in minutes instead of hours. When they come out of the dryer they are cool enough to handle barehanded, and are ready for the molder. You can cut the time from core maker to molder from hours (or days or months) to minutes.

OTHER ADVANTAGES

Best of all, make better cores than before. This method completely eliminates burned or overbaked cores. Fuel savings may be as much as 60% because all the heat goes into the core.

Find out what the improved *Foundromatic* dryer can do for your foundry. Call your nearby A-C district office for specifications showing new high capacity, or send coupon.



Foundromatic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

FOUNDROMATIC
Dielectric
SAND CORE DRYER

QUESTIONS and ANSWERS
About Dielectric Sand Core Drying

1. What is typical drying time for a core using the* Foundromatic *dryer?
A core that used to take 70 minutes to dry in a conventional oven, is dried in a *Foundromatic* dryer in as little as 3 minutes.

2. How big a core can be dried in the* Foundromatic *dryer?
Cores up to 400 pounds are being dried successfully in daily production. In fact, any core that will pass through an aperture 36 inches wide and 13 inches high can be dried.

3. What about collapsibility?
Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

4. How much maintenance is there?
Very little. Periodic replacement of tubes; oiling of rollers, and conveyor and blower motors.

5. How long will tubes last?
Tubes have an estimated life of 5000 hours.

6. Do I need an electronic engineer to help me with the* Foundromatic *dryer?
No. Once equipment is installed and operating, any personnel can be quickly trained to follow simple operating instructions.

SEND

Allis-Chalmers
Milwaukee 1, Wisconsin

Please send me specifications on the improved *Foundromatic* sand core dryer.

Name .....

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Company .....

Street .....

City ..... State A-4098

NOW!

*Lectromelt** offers you a line of high frequency induction furnaces

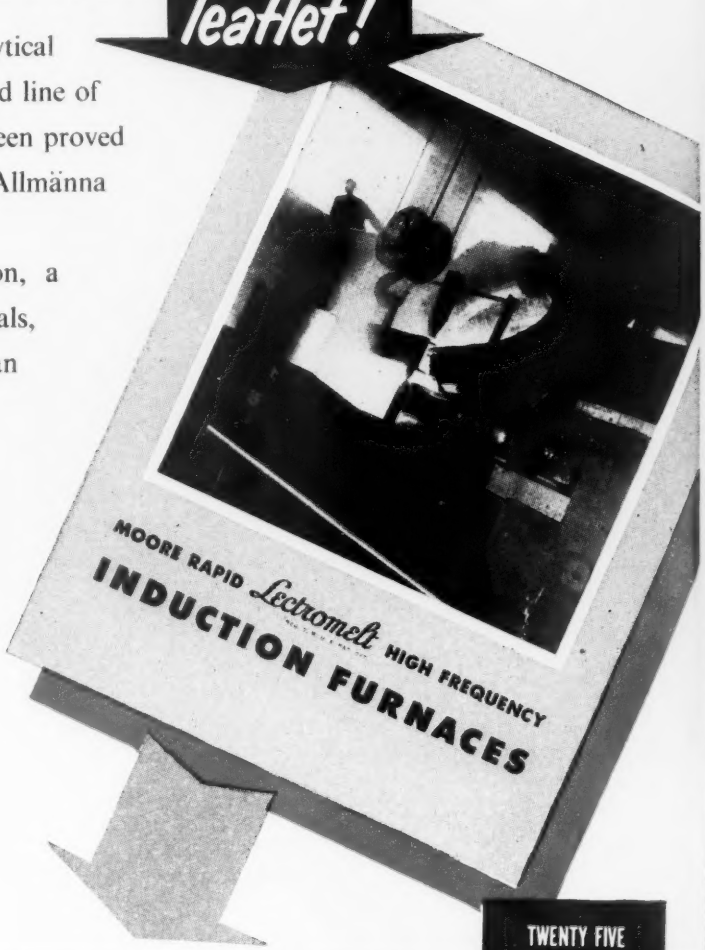
Proved in 27 years service!

Send for this leaflet!

Rapid operation, close temperature and analytical control combine to make this a highly respected line of High Frequency Induction Furnaces. They've been proved successfully since 1926 by the recognized Allmänna Svenska Elektriska Aktiebolaget in Sweden.

Pittsburgh Lectromelt Furnace Corporation, a leader since 1916 in the electric melting of metals, now adds this line of induction furnaces under an exclusive license agreement.

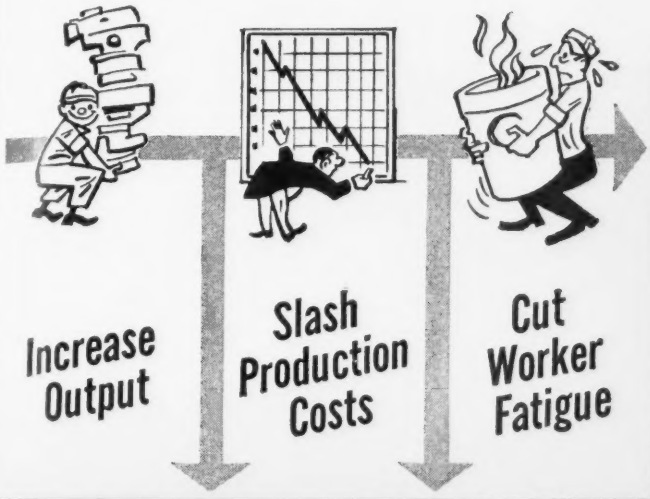
Melting, refining and holding steel and iron, and such nonferrous metals as copper and brass, are handled by these furnaces. Capacities range from 500 lbs. to 15 tons. For a Bulletin telling about these Lectromelt High-Frequency Induction Furnaces, write: Pittsburgh Lectromelt Furnace Corporation, 314 32nd St., Pittsburgh 30, Pennsylvania.

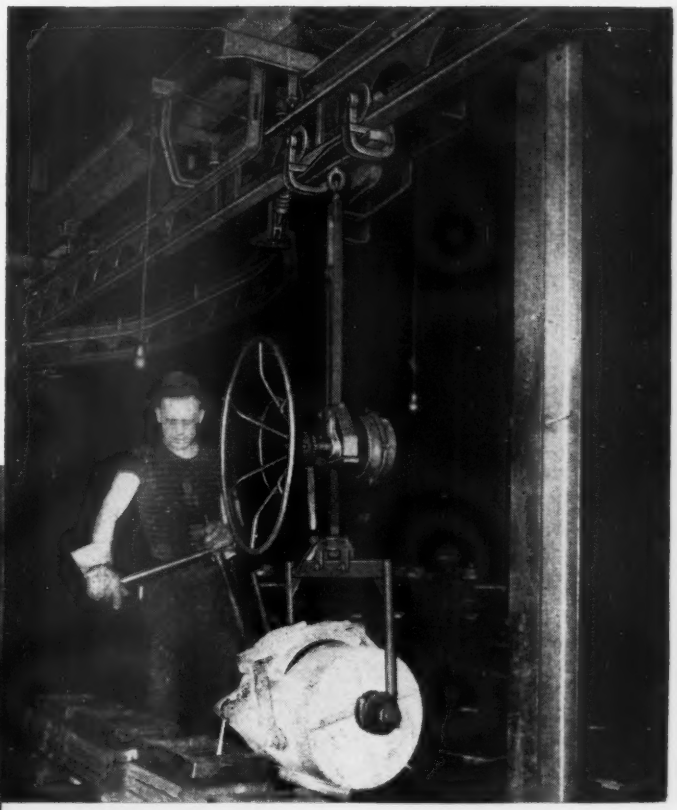


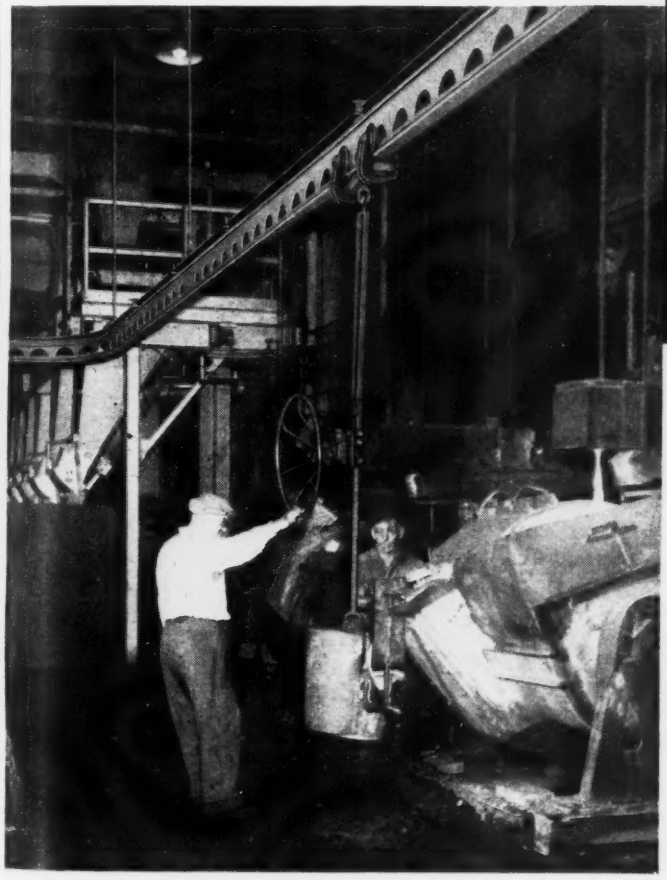
WHEN YOU MELT... MOORE RAPID *Lectromelt*

*REG. T. M. U. S. PAT. OFF.

Convey Hot Metal *the Efficient* Tramrail Way







THE advantages that a Cleveland Tramrail System bring to a foundry are so outstanding that the results are often little less than phenomenal. Wherever the equipment is installed, efficiency usually spurts upward an exciting amount.

This is very evident in the handling of hot metal. Large ladle-fulls can be taken directly from cupola to molds without in-between transferring. This means fewer trips and faster pouring. Heat loss is greatly reduced. The work is safer and easier because it is simply a matter of guiding the smooth-rolling overhead carriers.

The same overhead trackage can be used for most other handling: Patterns, cores, sand, flasks, castings, etc. and save time and worker fatigue on every lift and move.

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THE CLEVELAND CRANE & ENGINEERING CO.
3833 East 286th St., Wickliffe, Ohio

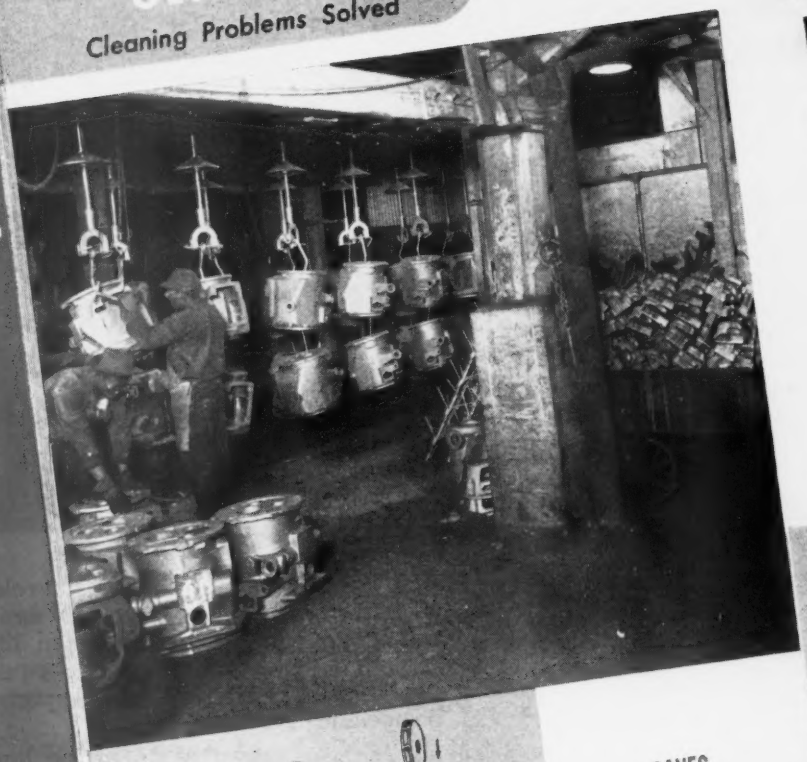
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

32 PAGES of PROOF *that* WHEE

GENERAL

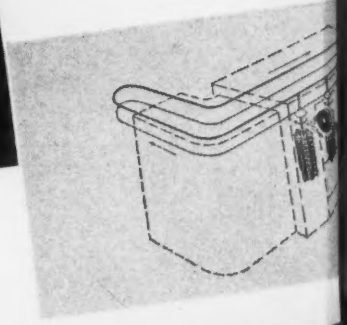
Cleaning Problems Solved

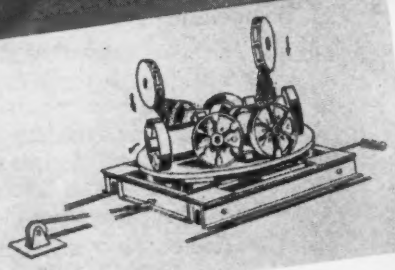
SAVES 50% IN CLEANING TIME



Gray Iron Castings

By installing this Wheelab Monorail Cabinet — 2 pass, inde spinner-hanger type — SUPE FOUNDRY, INC. of Clevelan saved 15,000 man hours yearly in ing approximately 10 tons of c per hour. Cleaning time has be creased 50% and the cost of repa has been reduced 40%. Prior to stallation of the Wheelabrator this plant was equipped wit tumbling mills and two 14' blas





SAVES $7,310.00 PER YEAR

Glass Grinding Machine Castings

Large, bulky jobs that cost so much to clean in an airblast room are handled far more quickly and economically in a Car Type Wheelabrator Room. Convincing evidence is the operation of such a machine at LOVE BROS., INC., Aurora, Ill. which decreased cleaning room costs 36%. In cleaning just one type of casting, the 975 lb. runner bar for a glass grinding machine, a saving of $7,310.00 per year was effected. In addition, seven tons of large, heavy castings are Wheelabrated each day with approximately the same percentage of cost reduction.

send for your copy today

of Catalog No. 724 "Special Cleaning Problems Solved by Wheelabrator Cabinets."

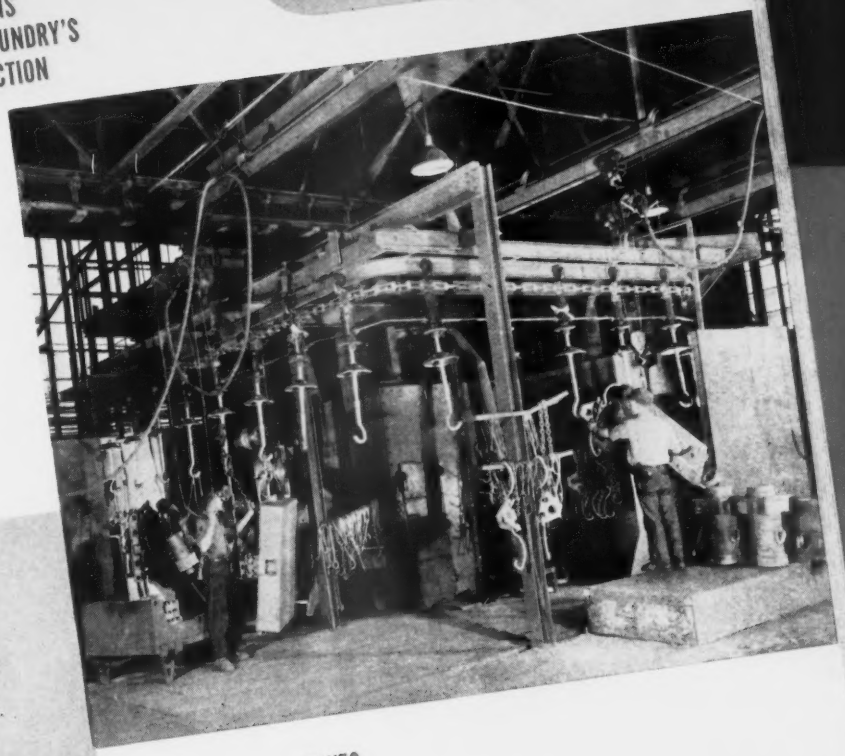
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

WORLD'S LARGEST BUILD

EELBRATOR® speed cleaning costs less

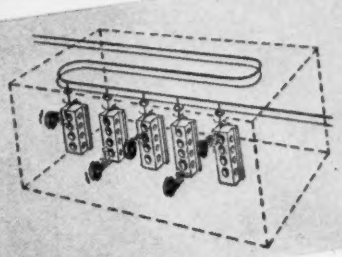
GENERAL
Cleaning Problems Solved

CLEANS
95% OF FOUNDRY'S
PRODUCTION

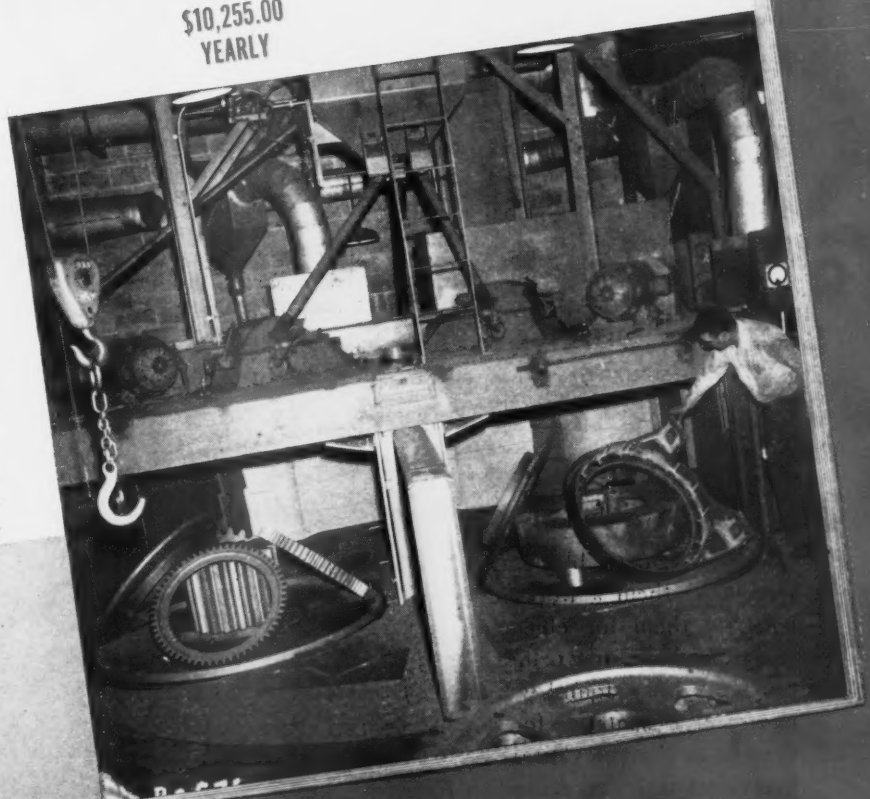


Gray Iron Castings

Although SPRING CITY FDRY. DIV., Waukesha, Wis. is a jobbing foundry, it operates on a production basis and cleaning room equipment has to be geared to fast, continuous operation. For this application, a Wheelabrator Monorail Cabinet — 3 pass, indexing, spinner-hanger type — with three Wheelabrator units, cleans over 95% of the foundry's production of green castings. Approximately half the tonnage is cleaned a second time to remove scale after heat treating.

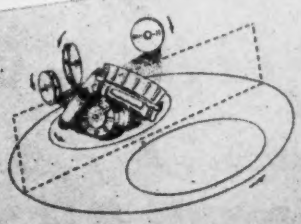


SAVES
$10,255.00
YEARLY



Steel Castings

A direct, traceable saving of $41.10 every day in cleaning approximately 30 tons of castings . . . an annual saving of $10,275 . . . is effected with this Wheelabrator Twin Table, equipped with 72" Twin Tables, at SAWBROOK STEEL CASTINGS CO., Lockland, Ohio. Castings are Wheelabrated three times: (1) in the green with gates and risers, (2) after annealing and (3) finish cleaning after grinding, welding, etc. Cleaning cost per ton of castings has been slashed from $4.75 per ton with airblast equipment to $3.38 per ton with the Wheelabrator.

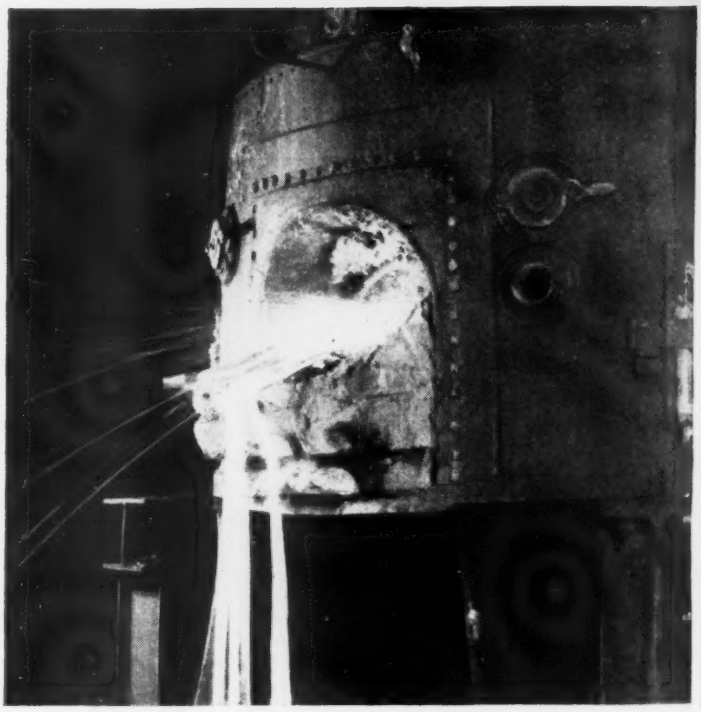


American
WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St. Mishawaka, Indiana

AIRLESS BLAST CLEANING

Rx for a metal-melting malady...

CRYSTOLON* slag hole blocks



Is your production suffering from too-frequent furnace shutdowns — while you're replacing slag hole blocks that can't stand the gaff?

There's a special Norton Rx — an engineered refractory prescription — for this metal-melting headache. *Install CRYSTOLON slag hole blocks!*

Then, like countless other foundry men, you'll get a new slant on modern furnace operation. You'll find CRYSTOLON blocks (made of hard, dense silicon carbide) resisting erosion and corrosion at temperatures up to 3050°F, and under severest back-slagging conditions. You'll find them outlasting fire clay more than 5 to 1, without spalling, cracking or loading — and that upwards of 30 hours continuous operation is not unusual for them.

Get Actual Proof

of how CRYSTOLON blocks can benefit your production. Give them a workout in your cupolas, and compare them for efficiency and economy with whatever you're now using. They're made in shapes to meet every foundry requirement. Ask your Norton representative for details, including prices, or write to NORTON COMPANY, 309 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

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EXPERT FOUNDRY ADVICE

without cost or obligation!

When you're searching for new ways to increase production efficiency and unit output—call in the Republic Pig Iron Metallurgist.

He will gladly make an operational survey of your plant that could turn up new methods of production without increasing overhead. His background of practical foundry experience, a thorough knowledge of pig irons and a natural ability to analyze enable him to make recommendations which often prove both valuable and profitable.

There is no cost or obligation for calling in a Republic Pig Iron Metallurgist. It's part of the service Republic offers to the foundry industry.

Let us know when you would like him to call at your foundry.

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GENERAL OFFICES • CLEVELAND 1, OHIO
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Republic PIG IRON

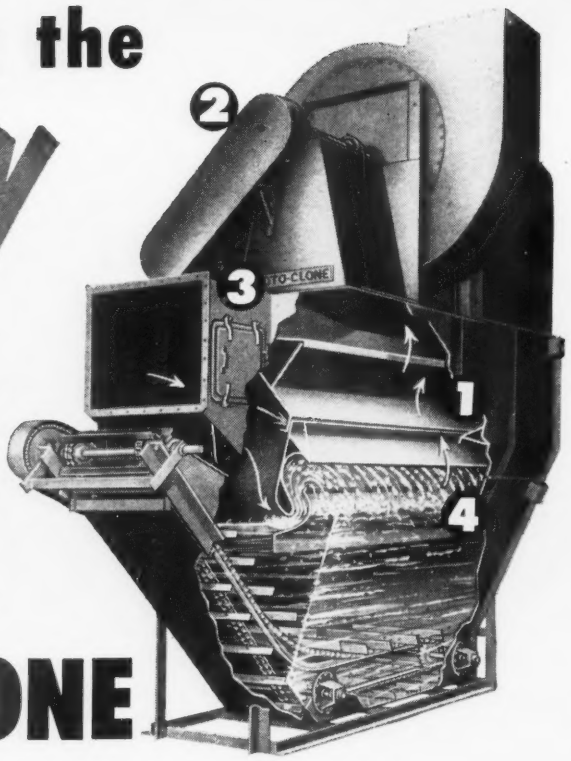
"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

REPUBLIC STEEL

Introducing the NEW DESIGN 4 TYPE N ROTO-CLONE



—1—

Improved and simplified entrainment separators further reduce Type N's low cost maintenance.

—2—

Addition of 4 larger sizes to permit handling of exhaust volumes up to 50,000 cfm.

—3—

Additional access doors with improved hinges.

—4—

Greater range in permissible water over-flow rate from control box.

Famous AAF Hydro-static Dust Collector Loaded with New Features That Reduce Maintenance, Add Life and Lower Cost

The high dust collecting efficiency of the Type N ROTO-CLONE is written on the records of thousands of plants in scores of industries. Abrasive cleaning, tumbling, sand conditioning, shakeout, core grinding and sand reclaiming—all posed dust collection problems in the foundry industry until the addition of this product to the ROTO-CLONE line.

The new Design 4 Type N, while retaining the proven cleaning action of its inverted S-shape water curtain, now adds features to further reduce and simplify maintenance, increase service life and *lower cost.*

Check the features listed here. No Gadgets—just sound engineering improvements that save you money both on first cost and every day of operation. For complete information on the new Design 4 Type N ROTO-CLONE write for Bulletin No. 277B.

Plus ADDED FEATURES FOR EACH TYPE N ARRANGEMENT

Arrangement B (Manual Sludge Removal)

1 Sloping sides for easier, faster manual clean-out.

2 Lower section designed for ready conversion from manual to automatic sludge removal.

Arrangement C (Continuous Sludge Disposal)

Heavier sludge ejector chain with longer chain pitch and slower speed—designed for longer life of all sludge ejector parts.

Arrangement D (Continuous Sluicing)

1 New drain control equipped with regulating orifice; built-in flushing connection and lubricated plug valve.

2 New water-supply control, complete with pressure regulator, which automatically assures constant water supply.

You Can Expect the Best from

AAF

American Air Filter

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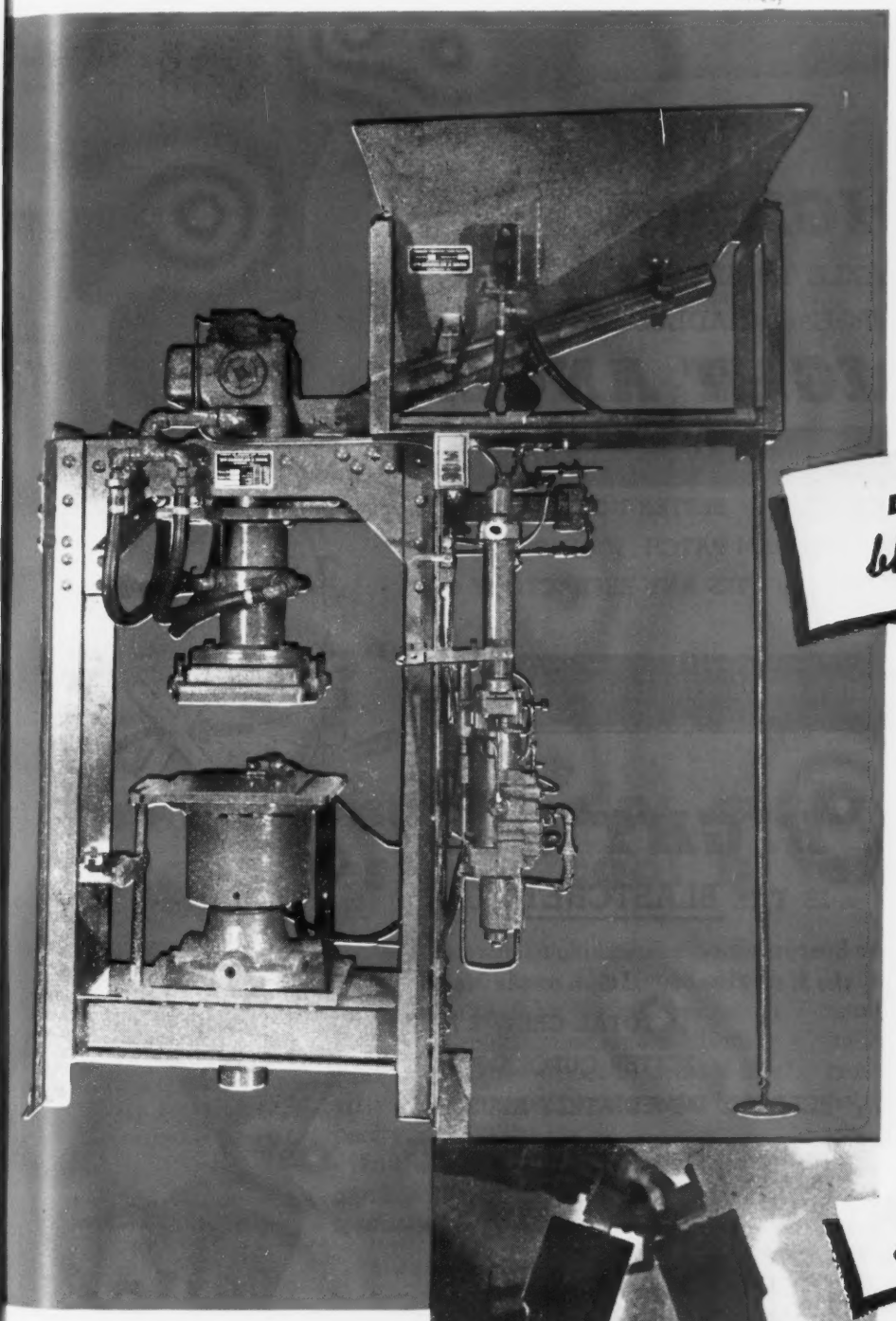
When the Mechanical Bird was Testing its Wings



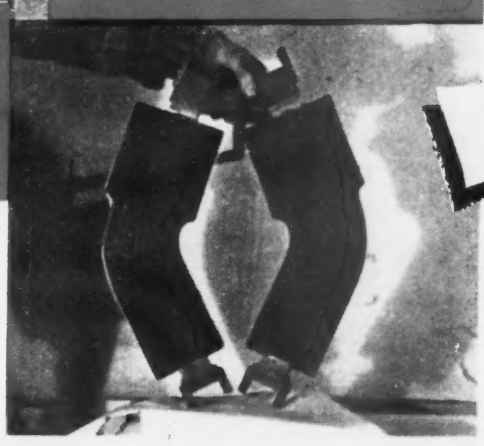
Demmler Core Blowers were already first . . . . . . just six years after the Wright Brothers hauled their ungainly "mechanical bird" out of the garage and into a world-shaking flight, Demmler introduced the first successful Core Blowing machine. These "new fangled" gadgets proved themselves by stepping up foundry production and starting a whole new trend in mechanized foundry operations. Today it's the same. The entire industry looks to Demmler for leadership in core blower design.

DOUBLES PRODUCTION
blows any core sand!

The Amazing New Demmler Sleeve Type Magazine

Typical of Demmler's pace-setting design — a sleeve type magazine that will blow ANY core sand without the need for special mixing. And that means sand direct from the foundry sand pile! It will not pack, regardless of moisture content or green strength!

The Demmler 1E-OS, shown at left equipped with the new magazine, is another pace-setter. It can be used with two drag halves so the operator can remove one core while the second core is being blown. It is possible to double production because there is no waiting for the machine. One push of the starting lever and the machine automatically completes one cyle and the magazine returns to filling position!



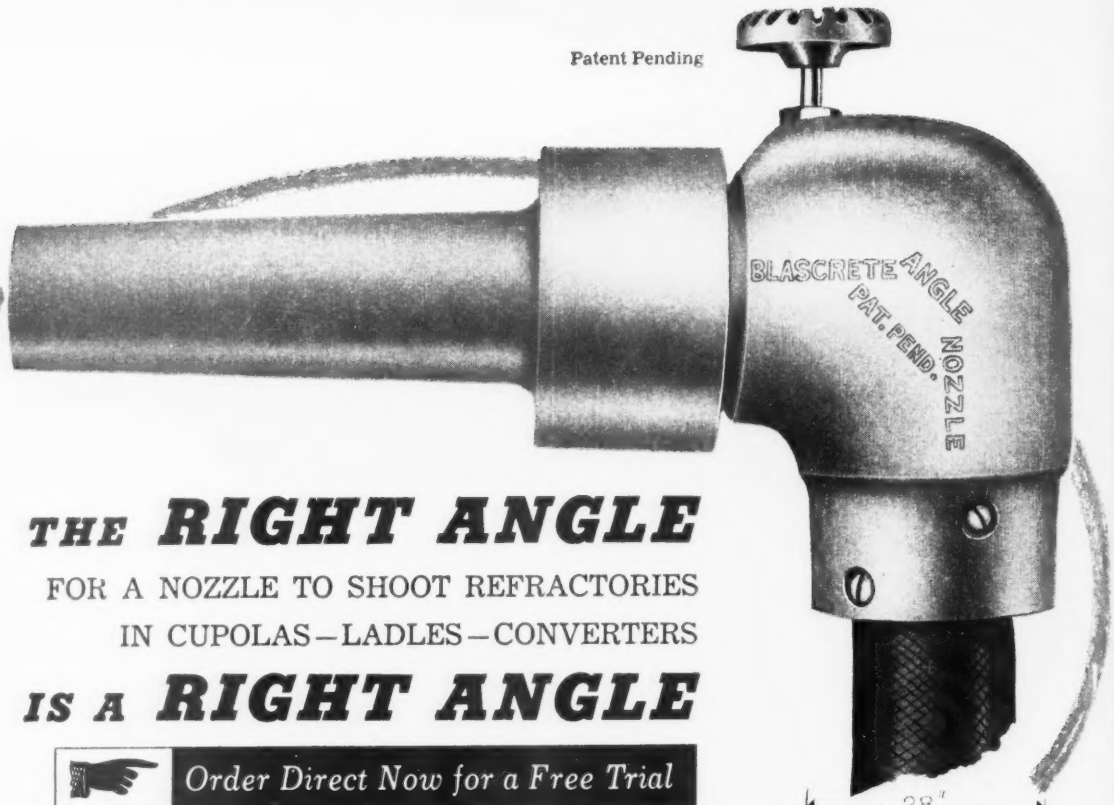
Here's Proof!

These cores were blown on a Demmler core blower equipped with the new sleeve type magazine. The sand was direct from the foundry's sand pile with a green strength of 7 to 9 pounds. No special mixing was done. Yet these cores will stand unsupported! The hand at left is merely balancing them. The sand is aerated in the magazine by a special process, eliminating any cratering or packing!

Write for literature

WM. DEMMLER & BROS. KEWANEE, ILLINOIS.

Patent Pending



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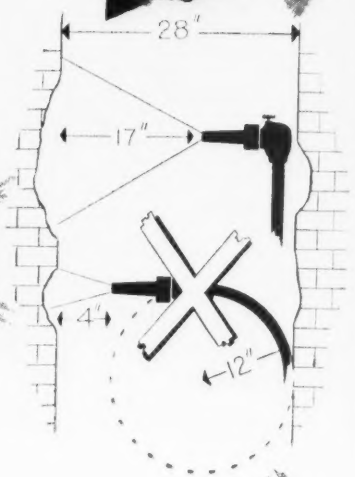
√ BETTER NOZZLE CONTROL
√ MORE UNIFORM PATCH √ LESS REBOUND
√ FITS ANY REFRACTORY GUN

makes the small job possible—makes the bigger job better



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IS THE BLASTCRETE GUN

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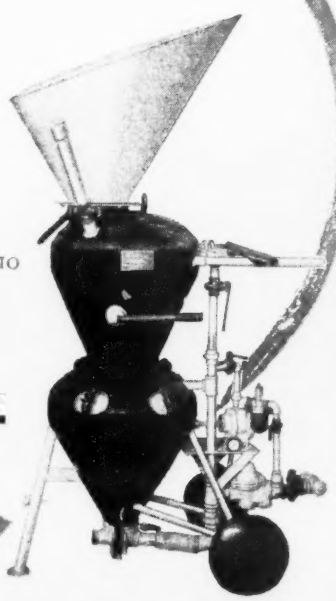
√ BETTER CUPOLA PATCH
√ REBOUND IMMEDIATELY REUSABLE
√ MEETS ASME CODE REQUIREMENTS



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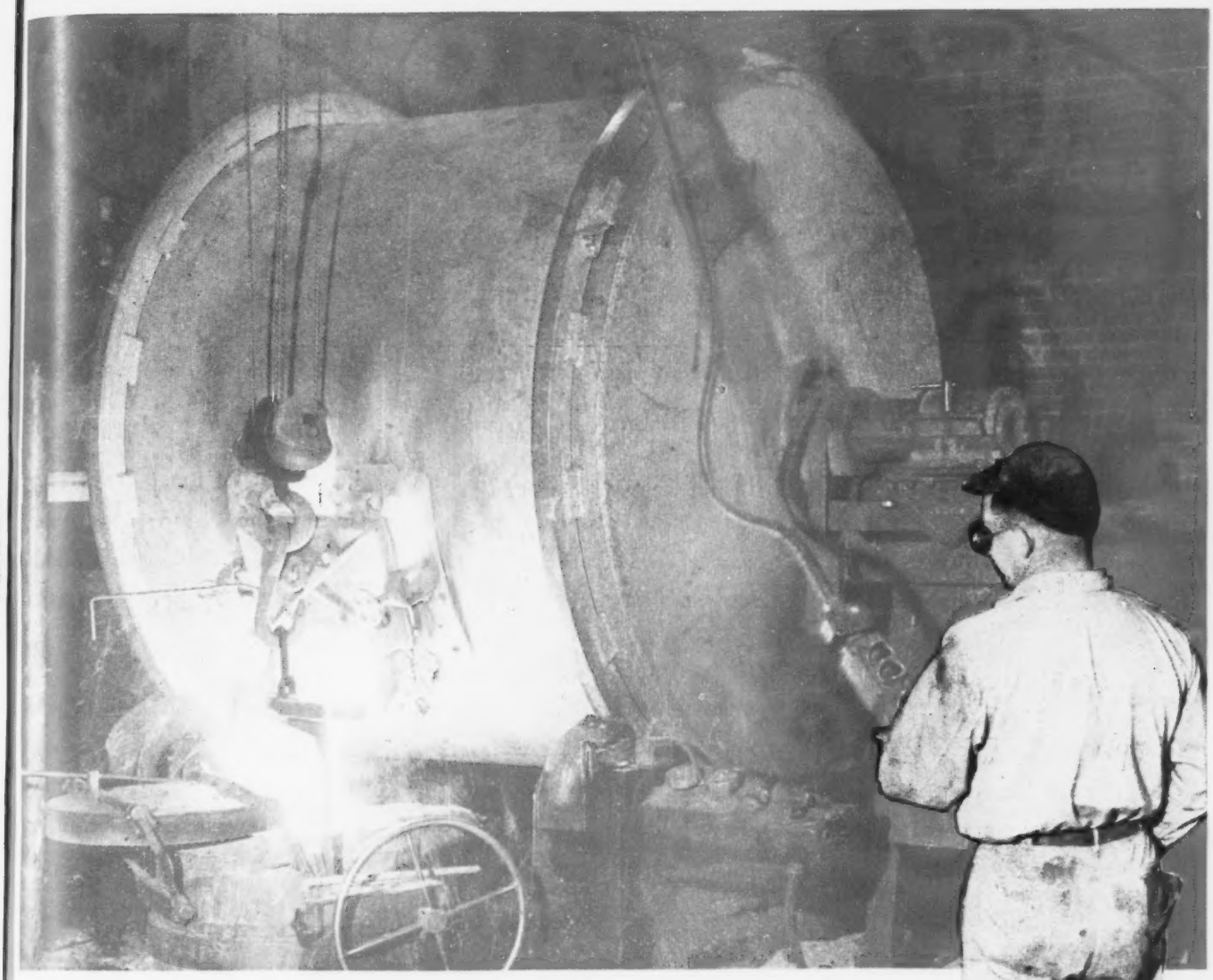
THE PYRO REFRACTORIES CO., CHICAGO, ILL. . OAK HILL, OHIO
GEO F. PETTINOS CO., INC., PHILADELPHIA

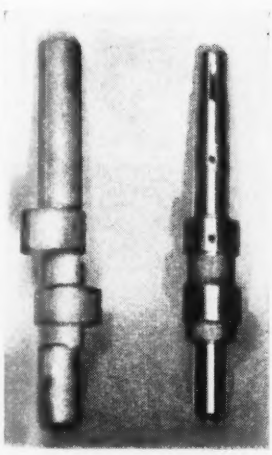
OR DIRECT TO:

BLASTCRETE SERVICE CO.

11154 Santa Monica Blvd.
Los Angeles 25, California



This furnace helps make ice cubes and cool breezes



Raw casting and finished crankshaft of York hermetic compressor. Cast from metal melted in Detroit furnace.

TWO Detroit Rocking Electric Furnaces produce the iron alloys for castings used by York Corporation in their ice-making and air conditioning equipment. The furnace illustrated has an 8000 lb. capacity; the other's capacity is 2000 lbs.

In the York foundry, Detroit Rocking Electric Furnaces were chosen to meet the requirements for high quality heats produced with speed and economy. Rocking action of the furnaces makes full use of heat from the indirect arc, and guarantees a homogeneous melt. Better metal means better castings, fewer rejects, lower cost.

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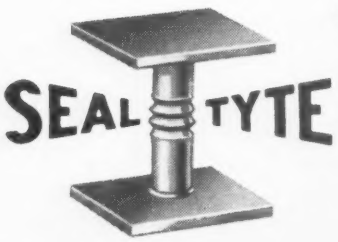

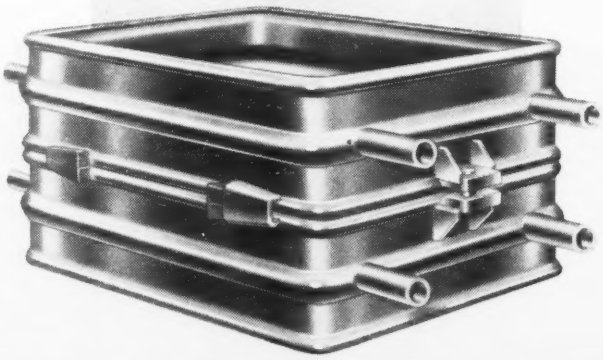

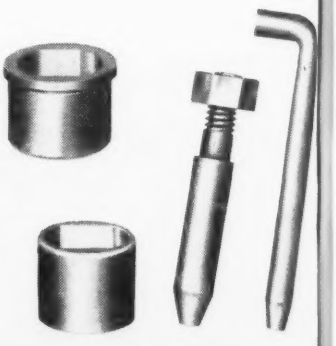

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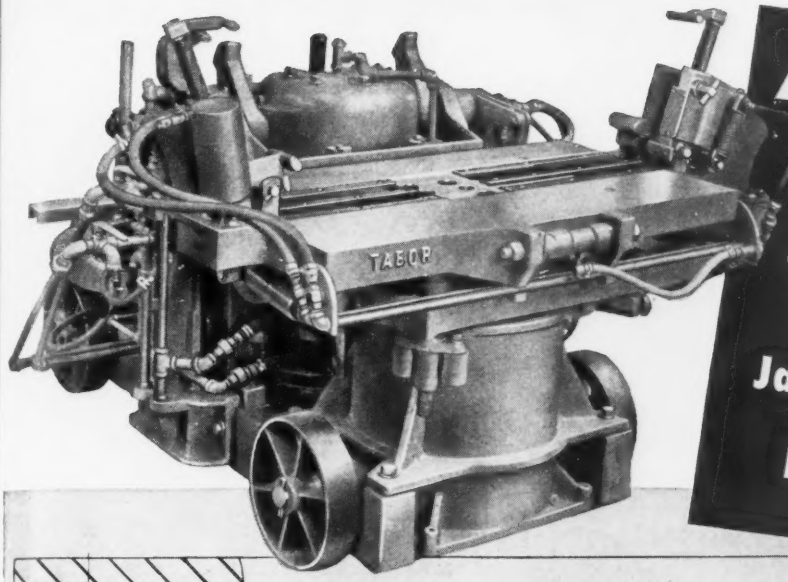
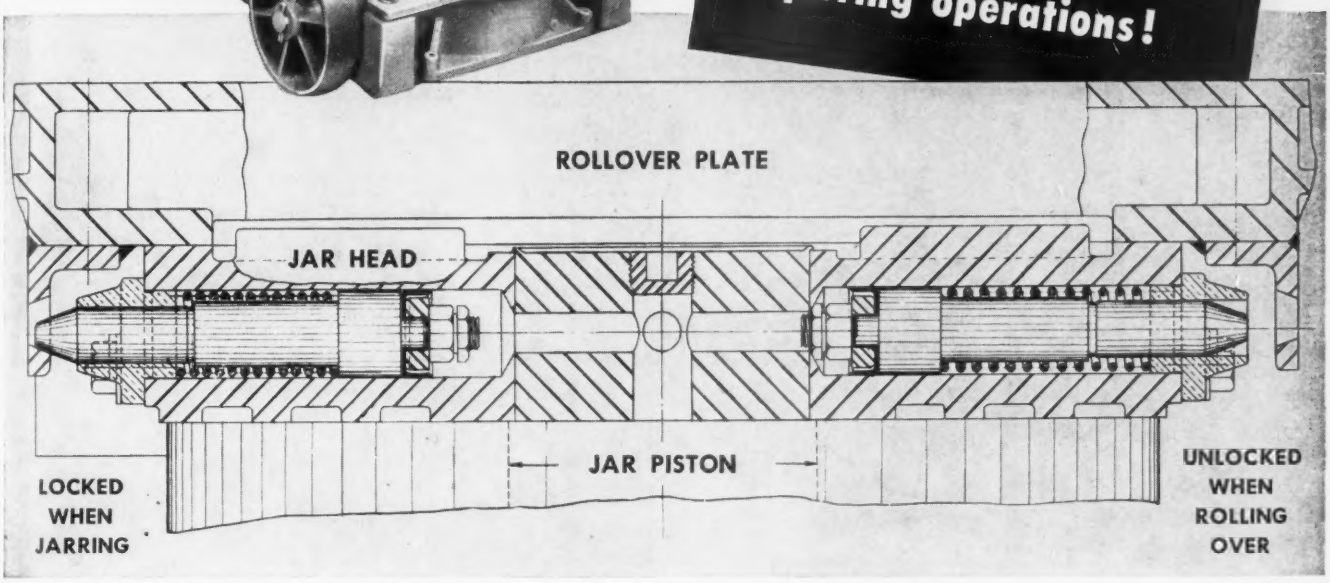


ANOTHER TABOR FIRST...

Rollover Plate and Jar Head locked during jarring operations!



ROLLOVER PLATE—JAR HEAD LOCKING DESIGN

The above sectional drawing illustrates Tabor's new locking arrangement. Jarring air pressure automatically throws rugged pins into seats under the rollover plate. Pins retract under spring tension when jarring valve is closed.

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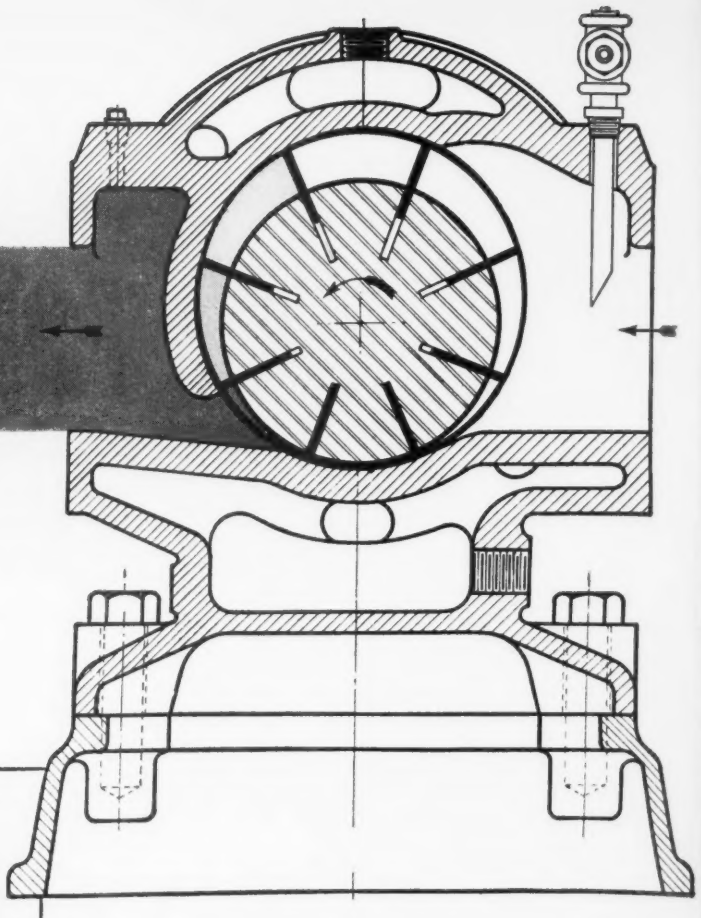

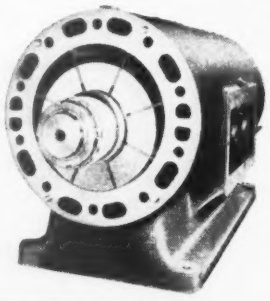

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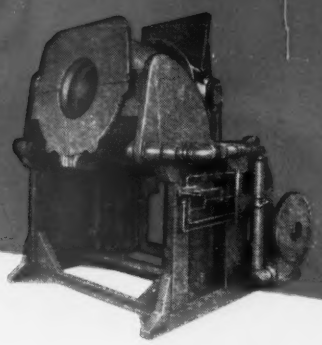

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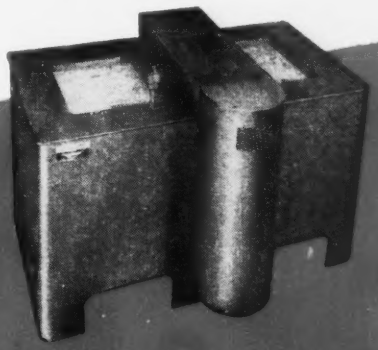

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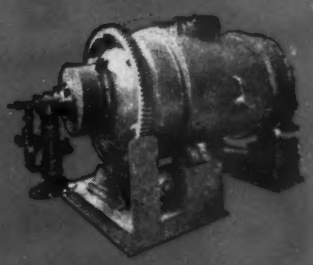

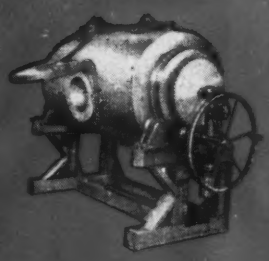

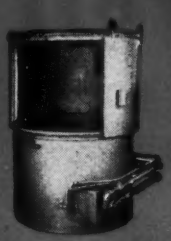

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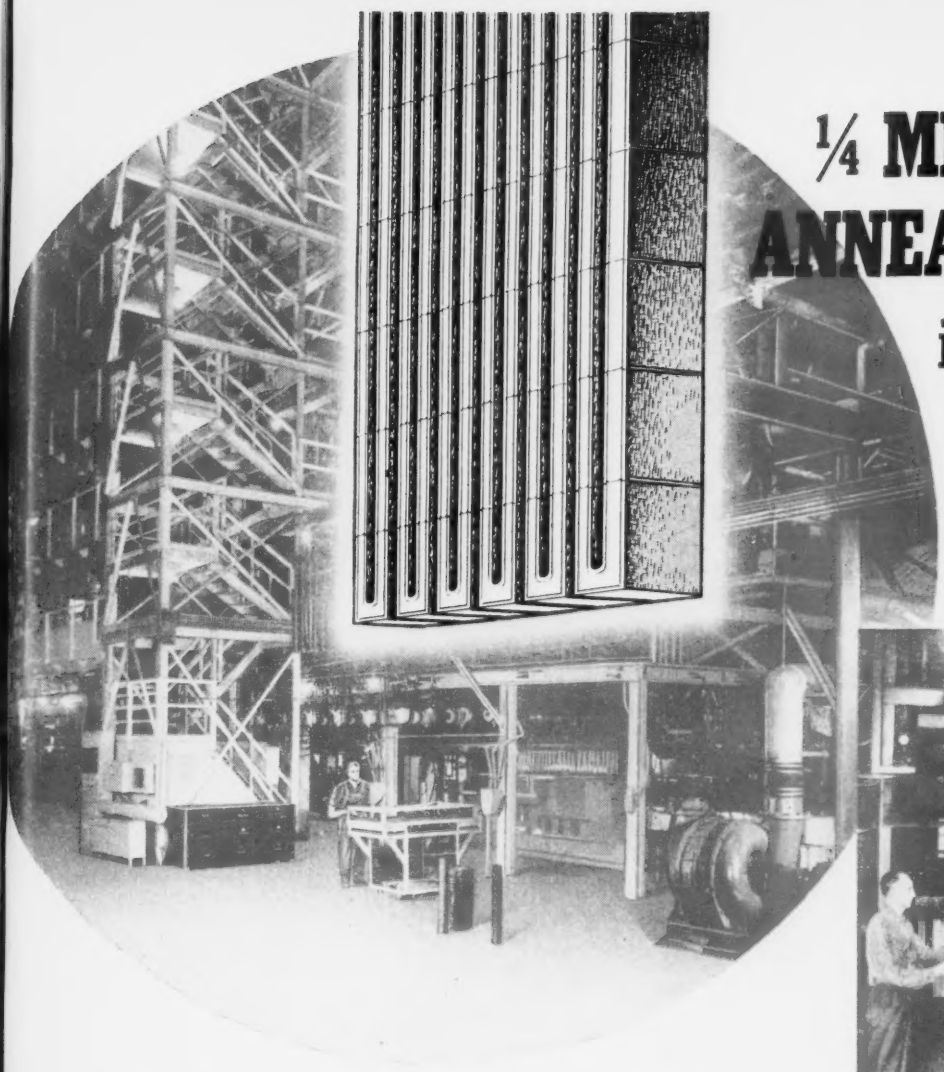
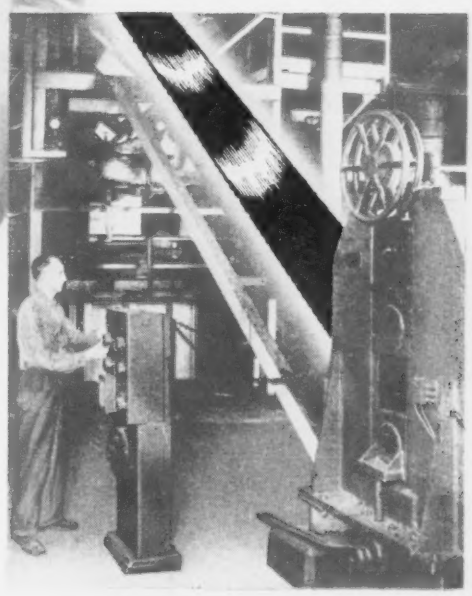


¼ MILE of PSC ANNEALING DUCT in Steel Plant of

INLAND



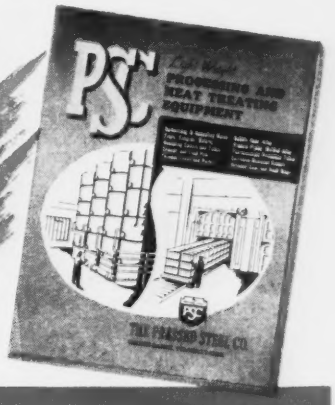
PSC 'Light-Weight' Alloy Equipment Solving Many Engineering Problems

This installation of PSC alloy duct for continuous annealing of strip steel is another example of how PSC "thin wall" construction is helping solve present-day engineering problems. Installed in the Indiana Harbor plant of Inland Steel Company, the system represents advanced designing in heat treating methods.

PSC "thin wall" construction effects hitherto impossible compactness and removability. It also introduces large economies in many types of construction, due to the savings in metal and to the lower fabricating and installation costs. Specializing in the precision fabrication of the weight-saving sheet alloys, PSC furnishes coils, ducts, flumes, manifolds, muffles and tubing for every heat and corrosion-resistant requirement; also tubes for radiant furnaces, and for furnace externals such as vent stacks. In any size and alloy.

Continuous strip steel annealing system at the Inland Steel Company plant, designed and built by Inland and Selas Corp. of America. PSC annealing ducts in black at top.

Send for Heat Treating Catalog 52



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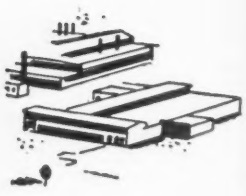

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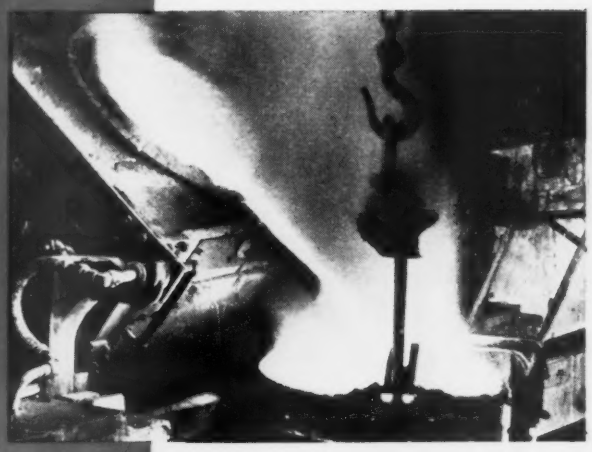
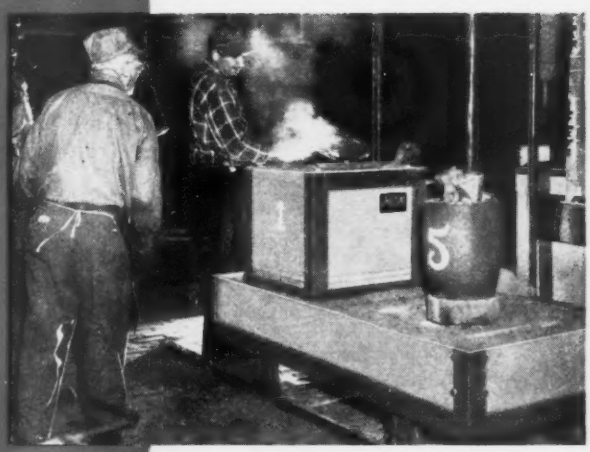
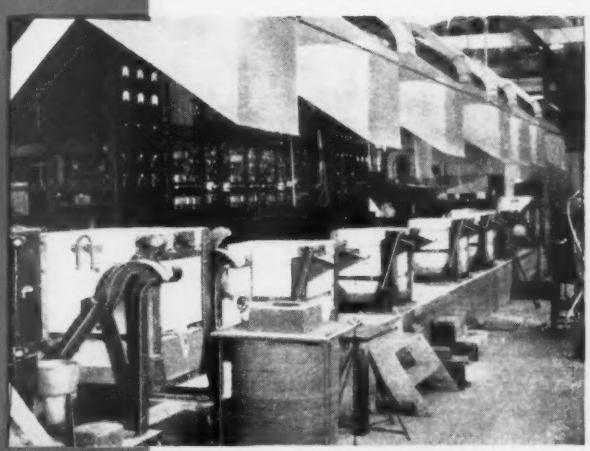


STEEL MELTING



NON-FERROUS MELTING



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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How Ladle Inoculants Reduce Chill . . . Produce High-Strength, Machinable Iron

One of the most significant developments in the field of cast iron metallurgy during recent years has been the widespread growth of the process of "inoculation" in producing quality metal to strict specifications. Inoculation has been defined as "a process in which an addition is made to molten cast iron for the purpose of altering or modifying the micro-structure of the iron and thereby improving the mechanical and physical properties to a degree not explainable on the basis of the change in composition."*

Various ladle addition alloys are used for inoculation of cast iron, but there is a wide range in the efficiency and potency of these materials. The 50 per cent and 75 per cent ferrosilicons are mild inoculants, but they are used as ladle additions principally as a means of adjusting the silicon content of cast iron. The 85 per cent and 90 per cent grades of ferrosilicon are much more effective inoculants. Inoculating power is further improved through the use of special inoculating alloys, such as silicon-manganese-zirconium ("SMZ" alloy) and calcium-silicon.

*Definition by H. W. Lownie, Jr., A.F.S. Symposium on "Inoculation of Gray Cast Iron."

ELECTROMET produces a number of alloys for inoculation, each of which has specific applications. The graphitizing inoculants are:

"SMZ" Alloy	60-65% silicon 5-7% manganese 5-7% zirconium
Calcium-Silicon	30-33% calcium 60-65% silicon
90% Ferrosilicon	92-95% silicon
85% Ferrosilicon	83-88% silicon
Special Graphitizer	A mixture of ferrosilicon and graphite for special uses.
75% Ferrosilicon	73-78% silicon
50% Ferrosilicon	47-51% silicon

These inoculants are usually added to the molten iron as it leaves the cupola spout, or during transfer from one ladle to another.

"SMZ" Alloy—An Efficient Inoculant

The benefits of inoculation are obtained largely as the result of rigid control of the structure of the graphite phase of cast iron which has received this treatment. The results of inoculation on the properties of a typical cast iron are demonstrated by the accompanying illustrations showing the effect of adding various amounts of "SMZ" alloy.

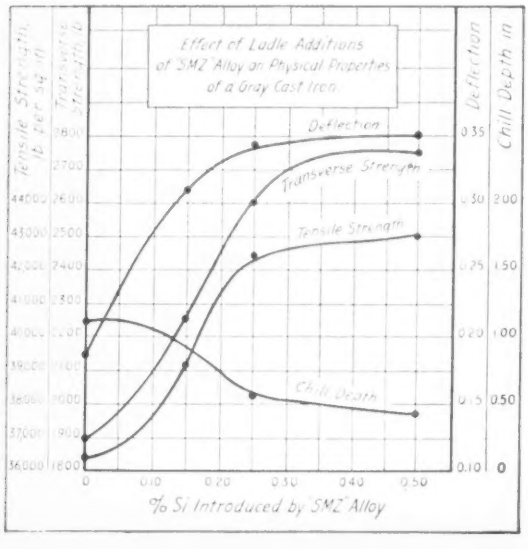

Fig. 1—These curves show how additions of "SMZ" alloy reduce depth of chill and improve mechanical properties when added to a series of irons selected to give the following final analysis: 3.10 total carbon, 0.60 combined carbon, 1.80 silicon, and 0.50 manganese.

Effects of Inoculation

The effects of graphitizing inoculants are: a drastic decrease in the chilling tendency of a given iron, a mild decrease in Brinell hardness, lowering of the section sensitivity of the metal, a definite increase in tensile strength, and an increase in transverse strength and deflection. These benefits are usually accompanied by improved fluidity, better castability, and improved resistance to wear.

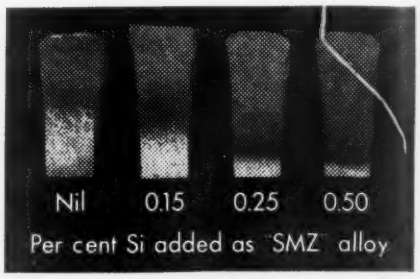

Fig. 2—These chill blocks show how progressive additions of "SMZ" alloy reduce the depth of chill.

New Stabilizing Inoculant

For the production of cast iron, ELECTROMET developed recently a special low-carbon foundry ferrochrome. This silicon-chromium alloy is so balanced in composition that it increases the strength and hardness of gray iron, without increasing chill. The new alloy has a nominal analysis of 30 per cent silicon and 50 per cent chromium. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill. Castings treated with the new alloy have an excellent balance between machinability and good resistance to wear.

Booklets Available

Further information about ladle inoculants is given in the booklets, "SMZ Alloy and Its Uses as a Ladle Addition to Cast Iron" and "Silicon-Chromium Alloy in Complicated Iron Castings." You may obtain copies, free of charge, by writing or phoning to the address given above or to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

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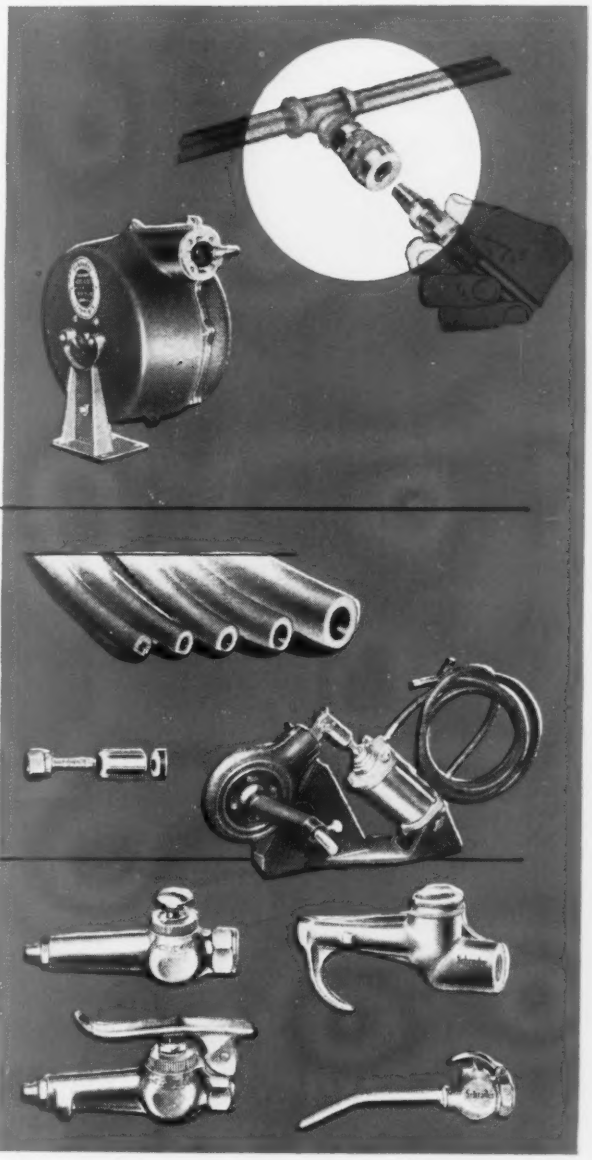
Keep idle air hose out of the way with a Schrader "Tuck-Away" Hose Reel—yet have it available at all times. Schrader Hose Reels work as easily as a window shade—and come in several sizes with up to 50′ of top-quality Schrader air hose.



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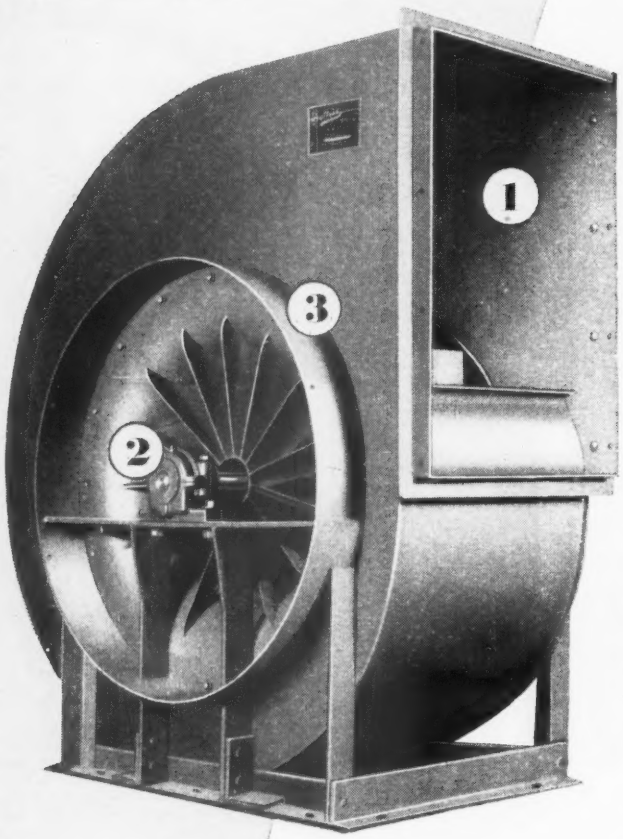

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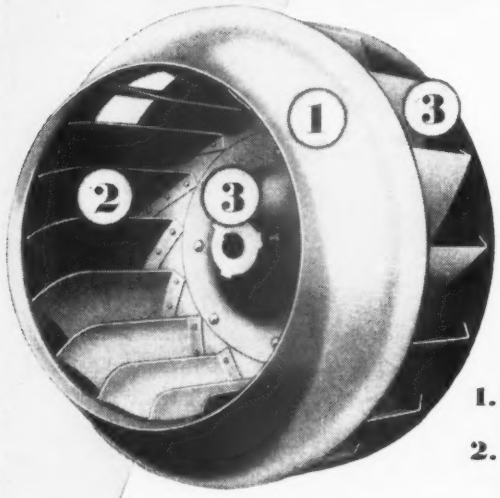
** The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*



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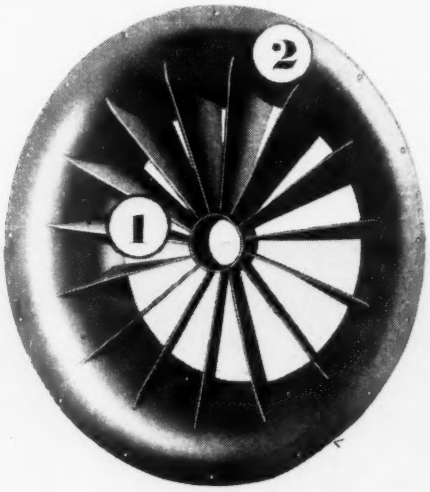

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1. Furnished as standard, and exclusive with "Buffalo", these stationary inlet vanes reduce turbulence and assure rated air delivery in spite of unfavorable inlet conditions.
2. Die-formed inlet bell matches wheel shroud

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Regardless of the availability of pig iron and other silicon addition agents for the cupola, you can always rely upon Ohio Ferro-Alloys Corporation for your needs. No matter what your production requirements for ferro-alloys may be . . . and no matter how these needs may fluctuate . . . our strategically located plants and warehouses enable us to meet your requirements in briquetted, lump or crushed form promptly. We invite your inquiries.

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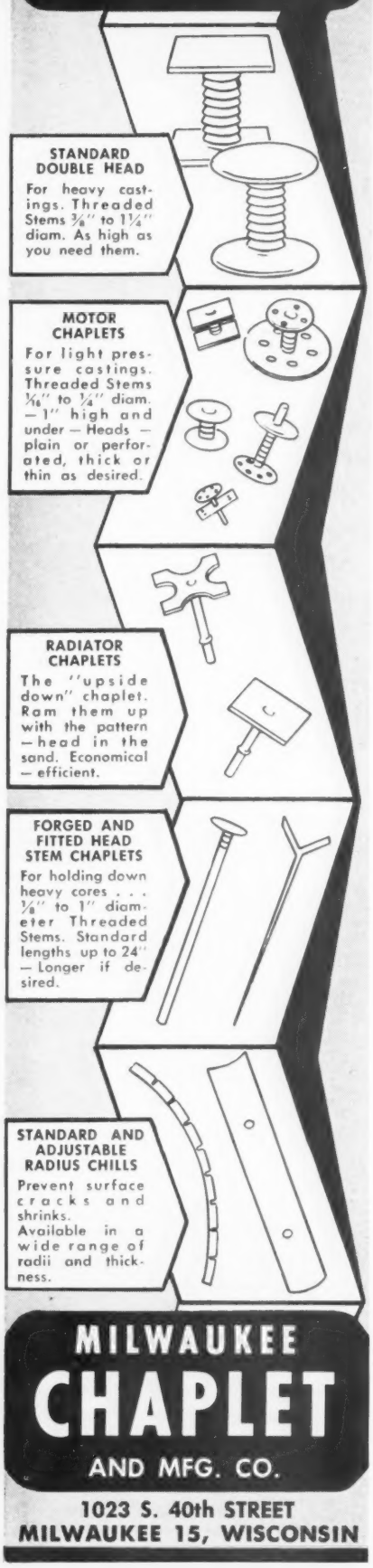

STANDARD DOUBLE HEAD
For heavy castings. Threaded Stems ⅜" to 1¼" diam. As high as you need them.

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For light pressure castings. Threaded Stems 1/16" to ¼" diam. — 1" high and under — Heads — plain or perforated, thick or thin as desired.

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The "upside down" chaplet. Ram them up with the pattern — head in the sand. Economical — efficient.

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For holding down heavy cores . . . ⅛" to 1" diameter Threaded Stems. Standard lengths up to 24" — Longer if desired.

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Readers' Comment

In Agreement on the Turks

TO THE EDITORS:

The letter of Raphael P. Massaro in your August issue, describing his nine months of activity in the Turkish Navy Yard, was as enjoyable as a letter from home. He says that he was disappointed at my failure to visit him; but he isn't half as disappointed as I am, now that I know the visit was planned (without my knowledge) and apparently cancelled —*and now*, he tells me.

Being a rather belligerent individual, I enjoy a good argument, especially regarding foundry sand practice. After reading the first four paragraphs of Mr. Massaro's letter, I started to sharpen up my old quill, preparatory to dipping it in vitriol. Then I finished reading his letter, and found that there was no basis whatever for a quarrel. He agrees with me 100 per cent. How can you fight with a guy like that?

Seriously, and judging solely from his one letter, I feel reasonably certain that Mr. Massaro is doing a good job indeed. When he speaks of this experience as his most difficult assignment in 29 years of foundry practice, I will put that down as a masterpiece of understatement. He writes of producing iron castings from one pound to 10,000 pounds, free of scales or rough surfaces. If so, (and I am not doubting his statement) he has done a remarkable job for Turkey.

I quite agree with his conclusions on dry-sand practice, for I saw such results duplicated at Kirikkale and Sivas; although even there metal penetration was evident, and the cleaning of such castings extremely difficult, slow and expensive. My assignment was to so condition Istanbul sand that green-sand production of small castings was to be materially increased and with a corresponding improvement in quality. I found this to be impossible without a magic wand. I consequently set up a hue and cry for a high-silica, uniform grain sand; and I am still crying. I shall continue to cry until such material has been made available for all foundries in Turkey. I am also begging for the refinement of bentonite recently discovered near Zonguldak; and the development of metallurgical or foundry coke.

I envy him this 12-month assignment among some of the finest moulders that ever wielded a trowel. In my short three months there, my efforts were distributed among five foundries, two of which poured iron, steel and nonferrous work. Practically one sand was used for all.

I would suggest that he contact Alonzo E. Taylor, MSA, Ankara, for assistance in the relief of some of the headaches; for I am sure he has them.

We agree perfectly on the intelligence, determination, enthusiasm, and downright goodness of the young Turk. He is a guy, inspired by his beloved Ataturk, to accomplish the impossible in his upward climb.

HAROLD E. HENDERSON

H. C. Macaulay Foundry Co.
811 Carlton St.
Berkeley 10, Calif.

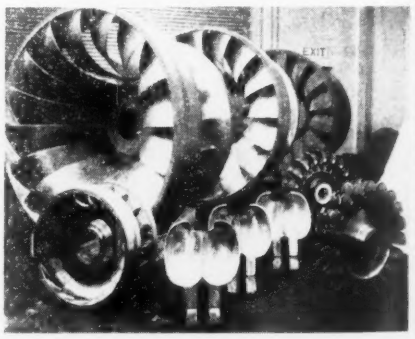
* * *

The Nickel-Aluminum Bronzes

TO THE EDITORS:

In recent issues of FOUNDRY I have noticed references to developments in the use of nickel-aluminum bronzes in the United States, particularly with regard to large castings, and you will be interested to learn that similar progress has been made in England.

As you probably know, our interest at Birkenhead is primarily the manufacture of ships propellers in manganese bronze and we are probably one of the biggest producers in the world of these components which are, without doubt, the largest nonferrous castings regularly made.



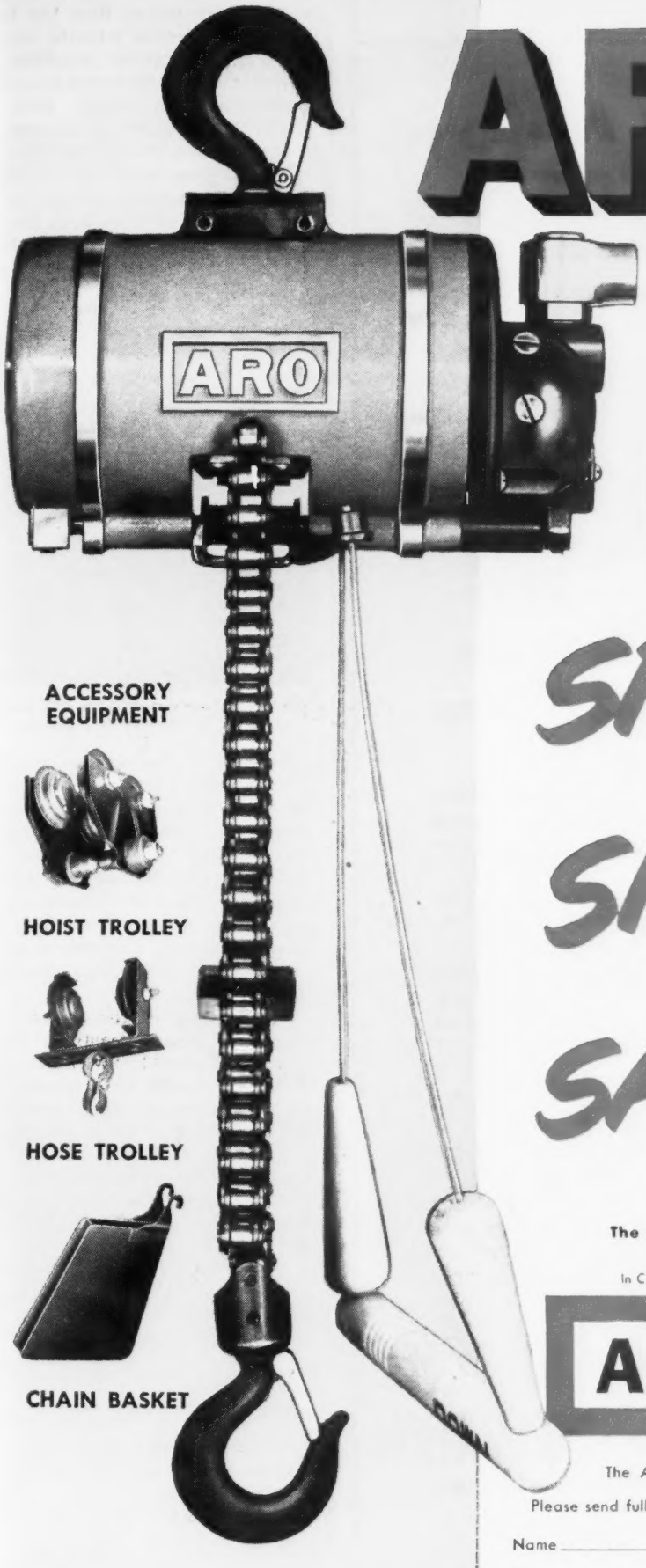
A group of Nikalium water turbine items

A few years ago we registered the name Nikalium for a special nickel-aluminum bronze, having an ultimate tensile strength of 42 to 44 tons per square inch combined with a good proof stress and elongation.

It was developed primarily for marine propellers where service conditions frequently call for a material

(*Concluded on page* 100)

ARO



1000 pound AIR HOIST

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SPEED...

Lift rate... over 40 ft. per minute!

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Overall length 10¼" weighs only 28½ lbs.

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Betters all safety requirements!

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ABC is produced from a scientific blend of the finest quality, carefully selected and specially prepared washed Alabama coking coals and premium quality, low volatile Pocahontas Coal from West Virginia.

ABC is the product of over 33 years of specialized experience and continuous research, aimed at constant improvement in uniformity, structure and carbon absorption characteristics.

ABC is produced under rigid laboratory control, beginning with the selection and preparation of the various coals, and ending with the finished product. No other coke producer operates a test cupola for regularly checking coke performance and carbon absorption.

ABC is dense, firm, and tough, but not brittle, thereby assuring minimum breakage during handling.

ABC is available in sizes to meet the requirements of any cupola operation.

ABC is produced in two distinct types—STANDARD and MALLEABLE. ABC special malleable coke is more widely used for malleable iron production than any other coke in the U.S.A.

ABC enjoys more widespread and diversified distribution than any other foundry coke—thereby assuring its users a more flexible and dependable source of supply.

Your inquiries are invited.

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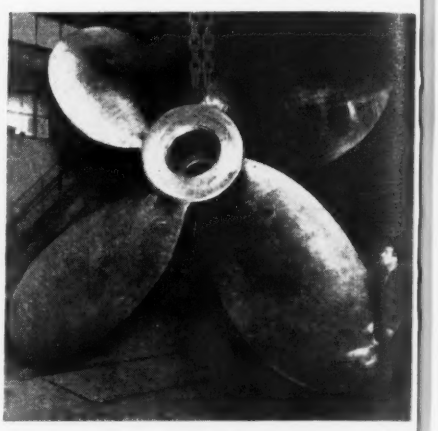
(*Concluded from page 98*)

considerably better than the normal manganese bronze hitherto used. Although the excellent properties, both mechanical and corrosion-resisting, of nickel-aluminum bronze have been known to the industry for some considerable time, its use for large castings has been restricted by difficulties in melting and casting, but over the past six years we have developed new methods with considerable success and now regularly pour castings up to 40,000 lb weight.



This propeller, supplied to Norway, has a diameter of 18 feet and weighs 12 tons

In view of the very successful results obtained with the large number of Nikalium propellers now in service, we have been encouraged to use the alloy for water turbine parts, and in particular have supplied a number of Francis runners, the largest sizes made to date weighing 11,000 lb each finished. The weight of metal poured for these castings was approximately 24,000 lb.

Photographs of these large nickel aluminum bronze castings are enclosed and, should you wish to publish them, we would have no objection. They were cast, machined and finished by this company at Birkenhead.

The propeller shown is one of many we have made in the past two years, and the weight of metal poured in this instance was approximately 40,000 lb.

F. J. TECTOR
The Manganese Bronze & Brass Co.
Dock Road
Birkenhead, England

* * *

Editorial Hits the Spot!

TO THE EDITORS:

Once again—congratulations. This time it is your editorial, "How Are YOUR Prices?" It is a good one!

J. W. KELIN
General Sales manager,
Midwestern Department

Federated Metals Division
American Smelting & Refining Co.
Whiting, Ind.

How Pratt Profits With 4 PAYLOADERS

The malleable foundry of Wm. E. Pratt Manufacturing Co., Joliet, Ill., uses four "PAYLOADER" tractor-shovels to cut costs drastically on all kinds of sand-handling and the moving of coal from silo to ovens. But Pratt is pioneering another profitable "PAYLOADER" use — the shake-out of castings right on the molding floor. The "PAYLOADER" that does this job is fitted with a special tine bucket which "combs" through the sand, picks out the castings, then lifts them and shakes out the sand. This fast, profitable operation releases several men for other work and eliminates another dirty manual job.

It will pay you to get the complete story on the Pratt operation and on job studies of "PAYLOADER" profit-making in other foundries. The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill.

PAYLOADER windrows sand quickly for cutting.

Coal is moved from silo to ovens fast and cheaply.

WRITE for "THE PRATT STORY" and other foundry job studies today.

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920

Take it from me

When You Buy the BEST... You're Bound to Get a BARGAIN!

Yes, you actually save money when you use Sterling Steel Flasks in your foundry. The famous ROLLED STEEL CHANNEL construction gives Sterling Flasks the strength and rigidity to withstand abuse, year after year. You can treat 'em rough and they still retain their accuracy. The unusually long service records of Sterling Flasks, in America's leading foundries, bring the annual flask cost down to rock bottom. That's why we say, *when you buy the BEST . . . you're bound to get a BARGAIN.*

Style 3/8 ND-RT flasks used in iron foundry.

Check these Sterling Features

Rolled steel channel construction . . . Solid reinforcing ribs . . . Heavy rolled steel sand flanges . . . Square corners . . . Full width bearing . . . Partings planed to an accuracy of .005".

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Don't Let It Happen to You

Now that the recent spectacular fire at Livonia, Mich., has effectively dispelled the notion that flames cannot wreck a modern steel and concrete building, industry in general is taking a closer look at its protection against a repetition of this disaster. Foundries should join in this search for potential fire hazards and ways to control them.

Despite the concentrated efforts of various fire prevention agencies and improvements in fire-fighting equipment, the nation's record in fire losses is poor. Last year fires cost us $815 million, an all-time high, and the National Board of Fire Underwriters says 1953 losses may top that figure.

In the last 15 years the annual cost of fires has tripled. Even after making allowance for the higher cost of buildings and the increase in number of structures of all types exposed to fire, progress toward reducing this enormous waste seems to be extremely slow. Certainly it is lagging when compared with the gains made by the safety movement as a whole, as measured by the reduction in number and severity of accidents.

While molten metal, furnaces and ovens naturally are potential fire threats for foundries, other hazards should not be overlooked. Actually, defects in electrical wiring and equipment have been the largest single cause of all types of fires in recent years.

Here are a few things the average foundry can do to cut the chances of loss through fire damage:

1. Have expert advice in regular inspection of electrical wiring and equipment, fuel pipes, insulation of furnaces and ovens, and other possible sources of fire.

2. Clean up the plant and prevent accumulation of combustible waste materials.

3. Provide the proper types of equipment to fight minor fires and instruct workers in their uses. But don't hesitate to call the fire department quickly when trouble occurs; firemen know more about fighting fires than you do, and delay may be disastrous.

4. Bring your fire insurance up to date.

The last point involves more than normal coverage of plant and equipment. What about customers' patterns in your possession? For a comprehensive review of what their loss can involve see the Gray Iron Founders' Society's report, "Are You Protected Against Loss of Customers' Patterns?" in our February issue, p. 152. It also may pay you to investigate "business interruption" insurance because a fire that stops your operations will cost more than merely the damage to building and equipment.

Maybe it's time we gave a little attention to the conservation of wealth instead of only to its creation.

William G. Guder

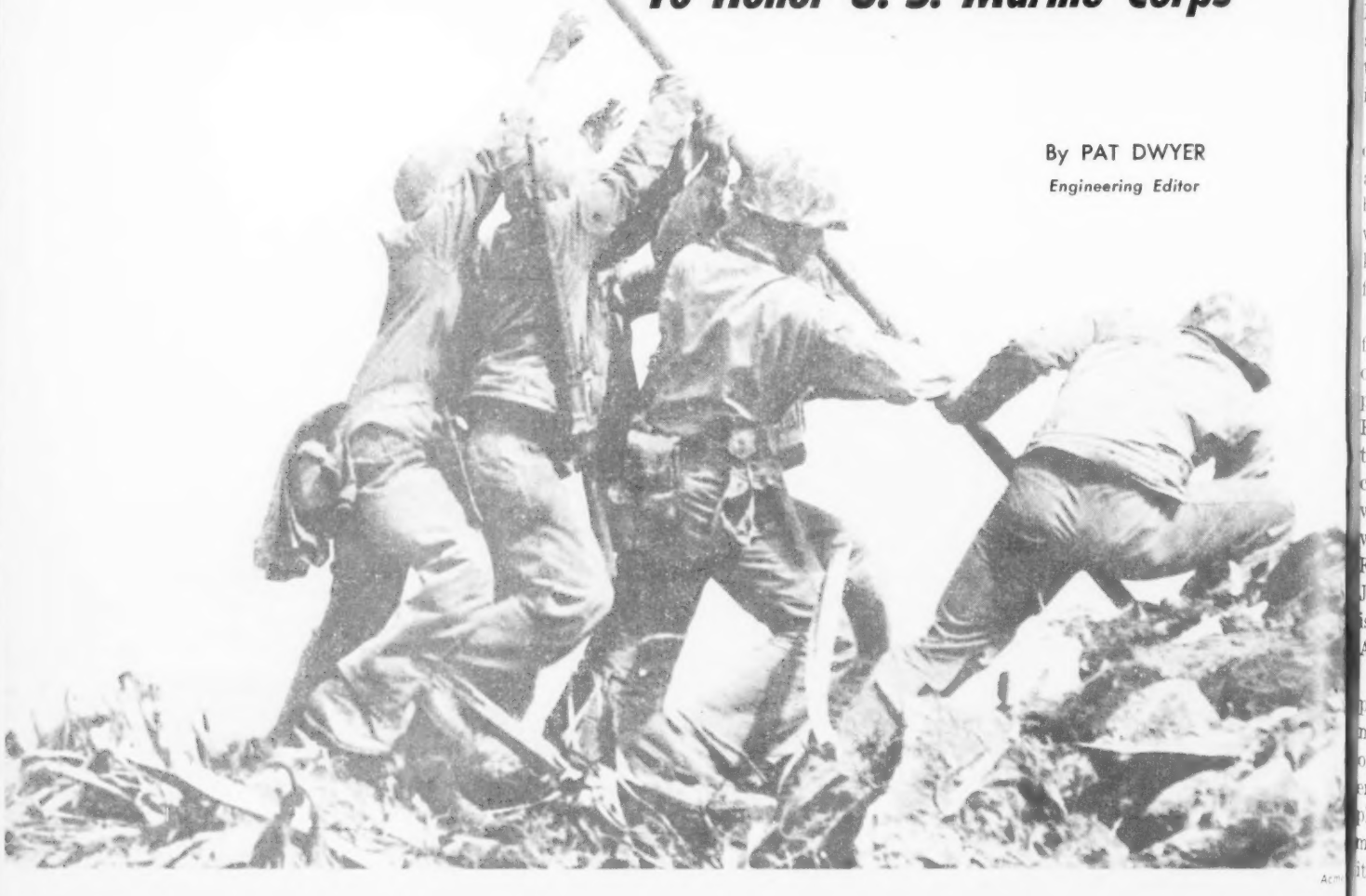
Managing Editor

Marine Technical Sergeant Charles F. Houts and Cpl. Richard R. Zander compare fingers with those of one of the six figures in the group

Huge Cast Bronze Memorial

To Honor U. S. Marine Corps

By PAT DWYER
Engineering Editor



A number of the cast figures in the group, each to be about 45 feet high after completion, are shown here prior to their assembly

THE *Marine's Hymn* indicates in its opening line, "From the Halls of Montezuma to the shores of Tripoli," that the leatherneck sons of Mars and Neptune get around. Yet these are only two of the places they have gone in a long list of hair-raising adventures that date back to Nov. 1775, when the Continental Congress, in session in Philadelphia, passed the following resolution: "Resolved that two battalions of Marines be raised . . . to be of the same number of privates as those serving with the Continental Army."

Members of the Marine Corps have died in every quarter of the earth and on all its seas. They are at rest, but not forgotten, and now a magnificent bronze statuary group to be erected in Washington will celebrate one of their most famous exploits and keep living and dead in memory green and in honor forever.

The Marine Corps war memorial, which depicts the famous flag raising on Mt. Suribachi on the island of Iwo Jima during World War II, has been in the process of construction at the Bedi-Rassey Art Foundry, Brooklyn, N. Y. Due for completion some time in 1954, the 110-foot-high memorial is to be composed of six 20-ton figures. It is claimed that it will be the largest bronze statuary group in the world. The group was modeled and designed by Felix deWeldon from Associated Press photographer Joe Rosenthal's prize-winning photograph. The cost is being paid by the Marine Corps War Memorial Association through contributions.

Large bronze statuary figures, either single or part of a group, are made according to one of two methods. In one—the lost wax process—a thickness of wax is employed to represent the pattern. It is enclosed between the inner and outer walls of the plaster mold during the construction period and is melted out after the mold is completed and while it is going through the drying stage in an oven. Metal poured into the cavity left by the wax duplicates every feature, including the thickness.

In the second method, a plaster pattern is prepared. The mold is made in sand in a metal flask. With the exception of several features connected with drawbacks and the core, the basic method of making the mold does not differ from that practiced in an ordinary jobbing foundry in the production of castings of the same general size and shape. However, a considerable amount of preliminary work in the sculptor's studios is required before the plaster pattern is delivered to the foundry. Up to a certain point, this preliminary work is the same regardless of whether the casting is to be made according to one or the other of the two methods. The following description applies to the second method.

Having decided on a definite design for the proposed casting, the sculptor prepares a perspective sketch for a guide to what he has in mind. He then fashions a miniature clay model in which every feature of the finished figure is worked out in ac-

Positive part of a mold is cut to establish metal thickness. Part of a shoulder, this section later was joined to another one and dried before pouring

Left—Preparing a "false form" section enables the molder to handle undercuts, such as deep shadows and folds in clothing. The original plaster (white mass) is used. *Right*—The "false form" is removed from the positive side of the form. Afterward the tightly packed sand block will be placed into the negative side of the form.

curate detail. The clay model is set up on a suitable stand, where the sculptor can refer to it constantly for verification in constructing a full size duplicate, also in clay. The clay is built around a wood or steel skeleton, made of pipes and bars erected on the inside. This is known as an armature.

A plaster casing several inches thick is built up around the clay figure to form a mold for the plaster pattern that goes to the foundry. This casing corresponds to the loam wall which a molder builds on the outside of a pattern in ordinary foundry practice. A thin coating of plaster tinted blue—or any other color—for a purpose to be explained later, is applied to the clay figure. This is followed by thicker plaster poured into rough wood forms built up around the figure in successive tiers until the clay figure is completely enclosed.

Under certain conditions the wood forms are not used. The soft plaster in gobs is thrown on by hand. In either method the wall is parted by thin metal strips set at convenient points to facilitate removal of the clay and armature and, later, the application of the plaster to form the foundry pattern.

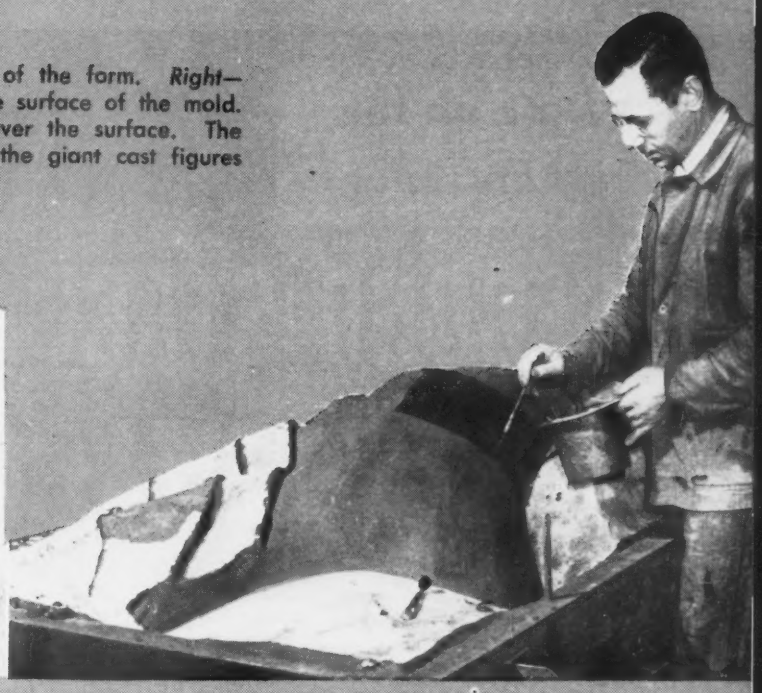
When the plaster mold is taken apart, the clay is removed. After the inside surface has been cleaned thoroughly, the mold is reassembled one, two or more sections at a time for the convenience of the man applying the plaster to form the foundry pattern. The interior face of the plaster mold is painted carefully with a solution of green soap containing a little tallow. This material fills the pores of the plaster and prevents any suction. The mold face then is covered with plaster to form the pattern which goes to the foundry. The soap film prevents this plaster from sticking to the plaster face of the mold.

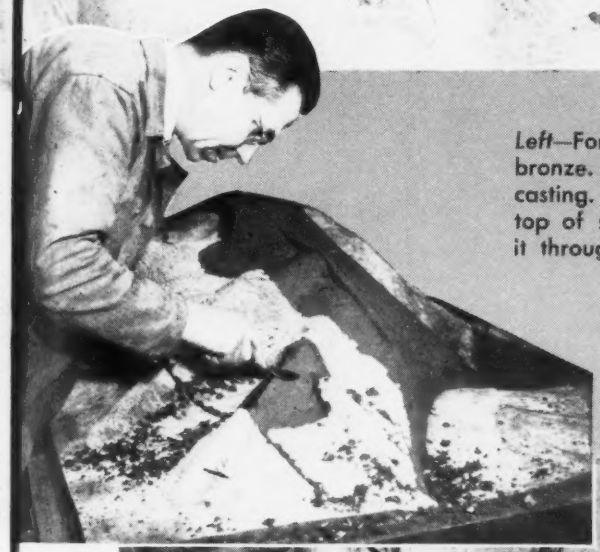
After the first coating of thin, liquid plaster, the remainder of the plaster is applied by throwing it against the face of the mold in handfuls, approximately in the same manner that a molder applies loam to the face of the brick work in a loam mold. Obviously, if a plaster mold were assembled in its entirety at first, applying the plaster would present an extremely difficult or even impossible problem. With a mold in as many sections as may be considered necessary, the plaster is applied readily to one section at a time until the entire face of the mold is covered with approximately 1-in. thickness of plaster.

Since only one casting is required usually, and since the pattern never will be used again, except possibly for exhibition or demonstration, no particular care is exercised in the removal of the plaster mold from the outside. It may be noted in passing that, up to this point, the two methods referred to for making the pattern are fairly parallel. At this stage of the process they separate. If necessary, the plaster mold employed in the lost wax process may be built up carefully in jointed sections that can be removed and reassembled many times for a simple statue only. For the production of as many wax patterns as may be required, a gelatin mold is made from the statue, as in ordinary practice. Briefly, in the lost wax method the plaster mold may serve for making one or for making many wax patterns. In the all-sand method, clay pattern and plaster molds are destroyed in the process of making the pattern.

In the method under consideration, the method employed on the Marine Corps statuary group, the rough outside plaster mold is knocked away with a hammer and chisel. When the expert operator notes the color tint on the plaster, he knows he has arrived close to the face of the plaster pattern. Thereafter he proceeds cautiously. All minor ridges and imperfections on the surface are removed under the supervision of the sculptor. After he is satisfied that the pattern conforms to his conception in every detail, he turns it over to the foundry. Large figures are divided into several sections for convenience in molding. Casting sec- (*Please turn to page* 208)

Left—The "false form" is being placed into the negative side of the form. *Right*—A coating of a mixture of graphite and water is applied to the surface of the mold. This operation is aimed at aiding the flow of molten metal over the surface. The workman shown here is working on the inner side of one of the giant cast figures

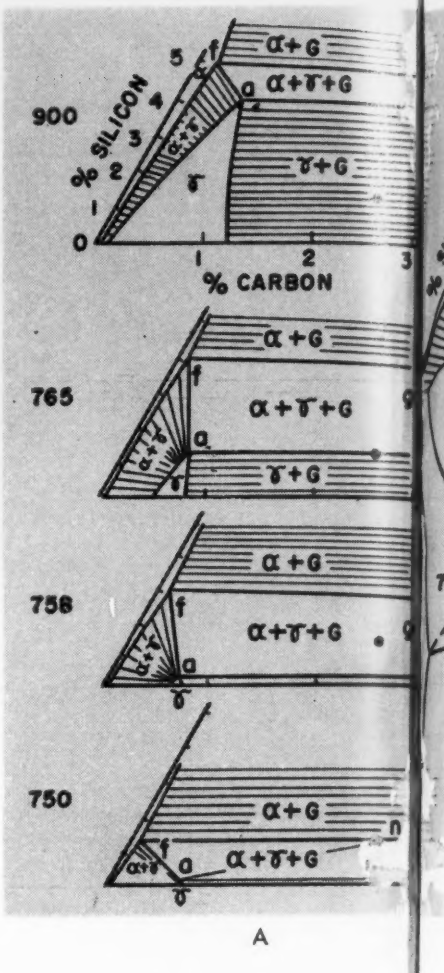




Left—Form of a right shoulder is carved to establish thickness of bronze. Sand carved away will be replaced with molten bronze during casting. *Below*—Molten bronze first is poured into a clay-lined box on top of shoulder form so that the full weight of the metal will force it throughout the form quickly. (Official U. S. Marine Corps photos)

A Note on the Mechanism of

SECOND-STAGE MALLEABLIZATION



A

The author suggests considering the direct transformation mechanism along with the indirect in determining the most economical circumstances for second-stage malleablization

By FLOYD BROWN

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THE time required for second-stage malleablization is of such economic importance to the malleable iron industry that studies are being made and reported constantly on means to shorten this time—studies concerned particularly with the effects of Mn/S ratio, silicon and carbon content, and miscellaneous elements such as boron or chromium.

The real significance of some of the results of these studies may be overlooked at times because no uniform nomenclature for all the various reactions which can occur in malleablization is universally used or accepted. And for the same reason of nomenclature irregularity, the uninitiated reader is apt to be understandably bewildered by seeing, for example, in the current literature the expression "destroying pearlite" used in describing a process in which pearlite nowhere appears.

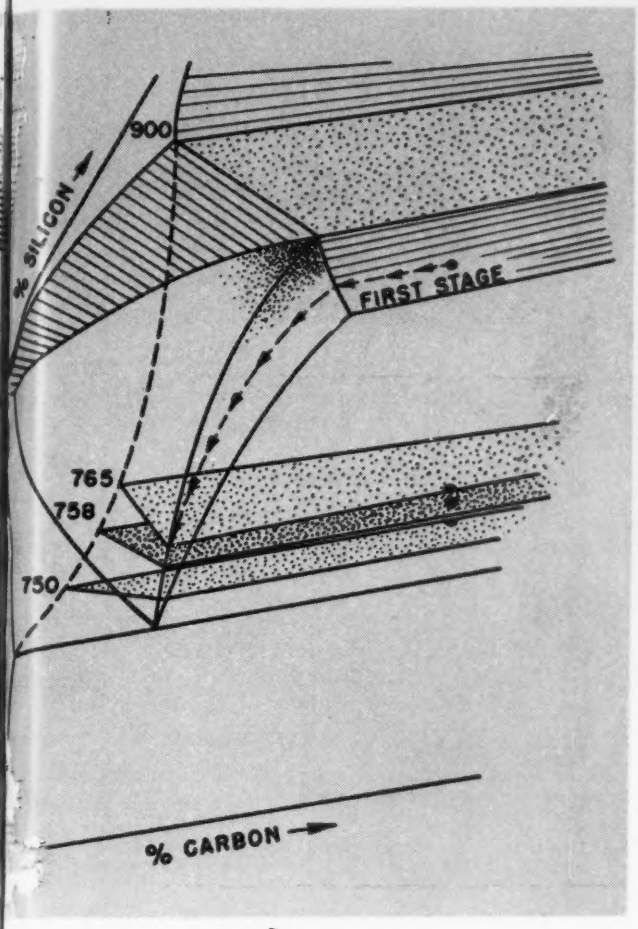
There is disagreement not only in language but in conclusions as well in various current publications on the mechanism of production of the ferritic matrix in malleable iron. This disagreement is not altogether surprising when one considers the problem, for example, of extracting a metallographic specimen from the center of a charge in a malleablizing furnace.

The purpose of this article is to present data on the mechanism of formation of the ferritic matrix—data taken with rigid control of atmosphere and of temperature. It is necessary, however, that a discussion of these data and the significance of related data from the literature be prefaced by a brief summary of the metallurgical processes involved, employing the terms of modern physical metallurgy.

Equilibria—It is instructive to consider first of all the equilibria which pertain to malleablization. This might well be satisfactorily done, if the proper reservations are observed, with either the plain iron-carbon diagram or with a vertical section through the iron-carbon-silicon system (which gives a modified iron-carbon diagram for a selected silicon content), though neither is rigorously applicable for completely defining equilibria for an iron-carbon-silicon alloy such as malleable iron.

For the present discussion, however, the successive horizontal (isothermal) sections through the corner of the iron-graphite-silicon system will be used, as shown in Fig. 1A, together with a simplified perspective view of the ternary as shown in Fig. 1B. In these diagrams the black circles represent the composition of a malleable iron having about 2.6 per cent carbon and 1.2 per cent silicon.

The 900° C (1652° F) isotherm of Fig. 1A shows the equilibria during first stage malleablization; at the end of the first stage the iron consists of austenite (gamma) plus graphite, with the carbon content of the austenite shown by the left end of the tie-line drawn through the black circle. Note in this isotherm the triangle formed by *a*, *f*, and *g* (*g* is so far to the right that the complete triangle cannot be shown on this scale); this is the eutectoid triangle, and an alloy with composition limits within it consists (in equilibrium) of austenite, ferrite, and graphite.



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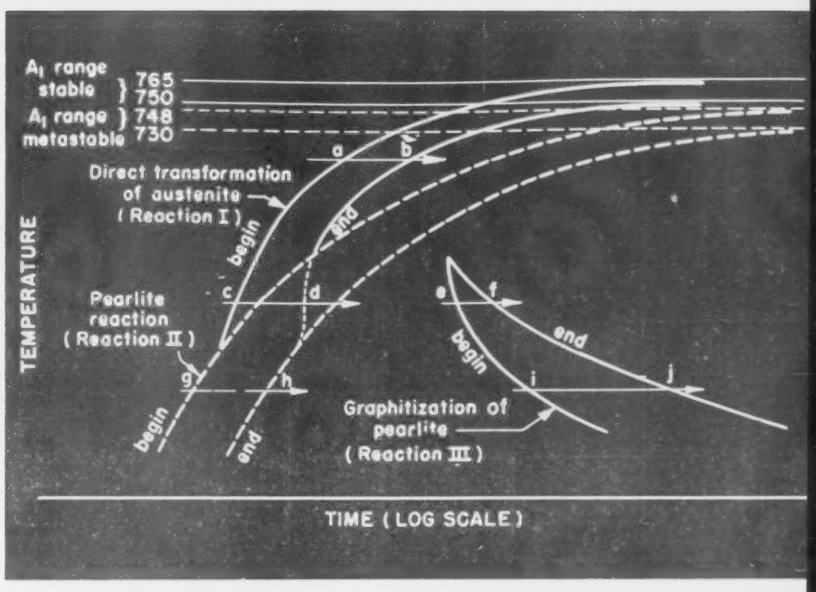


Fig. 2 (above)—Isothermal transformation diagram for the reactions of second-stage malleablization

Fig. 1 (left)—*A*: Isothermal sections of iron-graphite-silicon system showing phase equilibria pertaining to malleable iron (typical composition indicated by black dots). *B*: Simplified section of iron-graphite-silicon ternary showing eutectoid triangles (stippled) at same temperatures as *A*. All temperatures indicated are in degrees Centrigrade

Note also in this isotherm the ruled area ferrite (alpha) plus graphite. During cooling these two areas, the eutectoid triangle and the ferrite-plus-graphite field will sweep downward, crossing the black composition circle. When this alloy has cooled from 900° C (1652° F) to 765° C (1409° F), two things have occurred: (1) the austenite has decreased in carbon content, as shown by the left end of the line drawn through the circle; this carbon in practice deposits on the existing graphite nodules. (2) The eutectoid triangle has moved down to the point where any further cooling will place the circle within this three-phase area. The 758° C (1396° F) isotherm shows the triangle enclosing the composition of the specified alloy, which now consists of graphite nodules, ferrite and austenite.

There is no sudden decrease in amount of austenite as the line *ag* is crossed; the amount of austenite simply decreases continuously as the triangle sweeps across the circle. In the 750° C (1382° F) isotherm the triangle has moved almost all the way across, and the proportion of austenite has been reduced to nn/an; thus it can be seen that when the line *fg* is reached, no austenite will be left and consequently there will not be the sudden large quantity of eutectoid transformation which is experienced on crossing the eutectoid line of the binary iron-carbon diagram.

This same information is shown in Fig. 1B. Here the eutectoid triangles *a f g* of the four isotherms of 1A are shown stippled (and again are incomplete because the point *g* is so far to the right). During the first stage the composition of the matrix moves to the left along the tie line until it stops at the gamma solvus surface. During cooling (or interstage graphitization) the composition of the austenite moves to lower carbon, as shown by the path down the sloping surface. (The composition of the alloy as a whole, of course, does not change.) When the temperature of 765° C (1409° F) has been reached, the eutectoid triangle first crosses the composition point, and ferrite plus eutectoid graphite first appear. As cooling proceeds, the eutectoid triangle sweeps down and forward until it has swept entirely across the composition point and the entire alloy is ferrite plus graphite.

This above discussion has considered only the stable (graphite) system. There is a wholly similar arrangement in the metastable (iron carbide) system in which the same types of reactions may occur, though yielding cementite in lieu of graphite. The metastable diagram components, however, lie at lower temperatures than the stable and the metastable products can form only when the corresponding stable products have been suppressed either by rapid cooling or by addition of alloying elements. This is best discussed in terms of kinetics.

Kinetics—The foregoing discussion is one of the *possible* reactions. It is more helpful, however, in a discussion of the production of malleable iron to think not so much in terms of equilibrium as rather in terms of kinetics.

Reactions such as those related to the second stage of malleablization are nu- (*Please turn to Page* 203)

Graphite anodes are carefully sized for use. The one at the left was taken from the cupola drop

Right—More than fifty supervisors attend a weekly meeting to discuss figures on costs and profits

SOME TOOLS FOR QUALITY

In the Mechanized Jobbing Foundry

How a leading gray iron foundry goes about controlling variables involved in foundry practice is discussed in this paper presented before the 24th annual meeting of the Gray Iron Founders' Society

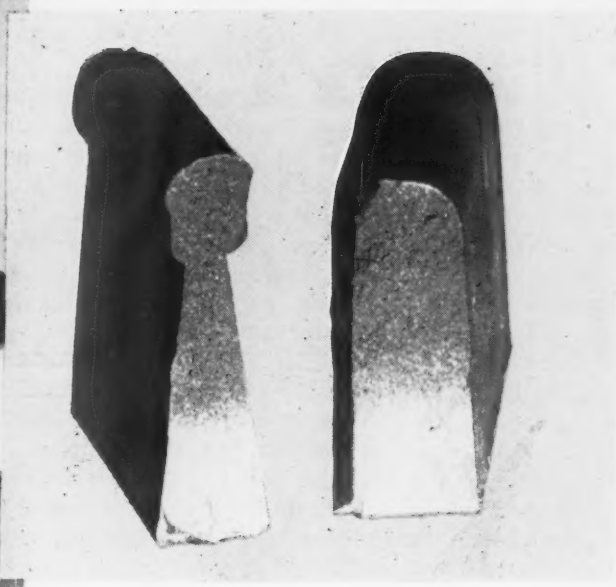
TWO focal points at which an effective improvement and advancement in a quality control program may be realized are the daily scrap castings in the foundry and trouble-shooting in the customers' plant. These are based on postmortem observations, but good progress can be made by starting from these points if a carefully planned attack is made on each of the problems arising. Pre-planning for quality before the castings are made is necessary, of course, but it is questionable whether any group's combined knowledge of foundry technique can foresee all the variables that might be encountered and compensate for them in advance.

Recording of Defective Castings—The success or failure of a foundry quality control program is greatly influenced by the correct designation of the cause of casting defects. It is necessary to determine an accurate cause of the defect in the scrap casting and make a record of it in the daily scrap analysis.

We have a committee composed of the foundry supervisor; superintendents of the coreroom, melting department, pilot foundry, cleaning room and pattern shop; the plant metallurgist; the plant inspector and a clerk who records the findings of this group. We found it absolutely necessary to combine efforts of this group of men to determine correctly the cause of scrap defects. Even with this type of study, some of the real causes of casting defects are not determined without subseqent follow-up and more study by special tests, chemical analyses and on-the-job study of molding and coremaking operations.

Our plant manager insists that this group be present at the scrap take-up each day.

In order that this group may do an intelligent



Careful analysis of chill fractures aids greatly in control of metal composition

IT CONTROL

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job of analysis and correlate their findings with our sand and metal control and our production procedures, each casting has a pattern number, a date and a shift number cast on its surface. When castings are rejected at the various inspection stations, they are taken to one central location and separated by date, pattern number and shift number. We have three shakeout stations and three cleaning rooms as well as numerous final inspection stations where dimensions are checked. Defective castings from all of these stations go to the central scrap take-up station.

In any foundry operation, if scrap take-up is handled in this manner, there is no question that all of the defects listed in the AFS *Analysis of Casting Defects*, and more, will be uncovered at some time or other. Quality control then can be started or improved by carefully studying the cause of the defect, establishing a method and/or correcting all the materials involved with procedures so set up that the defect cannot recur.

The records of the causes of casting scrap obtained at the scrap take-up meeting are statistics which will indicate the place to begin to improve quality control. For example, the scrap loss may be caused predominantly by a sand condition rather than by a metallurgical or mechanical deficiency. There does not seem to be any question that proper records will show where the greatest economies can be made and direct quality control efforts toward the factors responsible for the greatest loss.

It is obvious that if you have a mold shift, core shift, swell or crush, it will be necessary to set up facilities to measure pattern equipment, cores and core boxes and the final castings.

If you have shrinkage, metal hardness, chilled edges, and misruns, it will be necessary to start chemical and temperature controls of the metal used to pour the castings.

If you have sand holes, buckling, scabbing or a blow, it will be necessary to set up sand control in both the molding and the coremaking departments.

Shrinkage, sand holes, slag holes and blowing also indicate the need for a careful study in gating and risering techniques.

The correct analysis of casting defects, and their subsequent elimination and control, forms the basis for improvement and development in a foundry quality control program. From this point we have moved in the direction of closer control of sand and metal, established inspection in the plant and in the field,

have revised our molding and core-making procedures and have found it advantageous to set up a small pilot foundry to improve our knowledge of gating and risering and general foundry techniques.

Inspection of Machining and Assembly—Following the castings made in your foundry through your customer's machining and assembling operations points out further defects, correction of which improves the quality of the castings and reduces the scrap loss in the foundry. Study of the defects encountered in the field indicates that leakage, warpage, cracking, internal porosity and deviation from proper dimensions are the principal causes of complaints.

The major portion of our field work to improve our quality control is carried out by our inspection department. This is one of the reasons for having the chief inspector or the plant inspector at the daily scrap take-up meeting.

On the basis of the findings in the field, we have improved our dimensional tolerances, as cast, have recommended and have had accepted changes in design to eliminate internal porosity and simplify the manufacture of the casting, have obtained permission to alter patterns to bring the casting to the required drawing dimensions, have simplified customers' finishing operations by eliminating special machining setups and touching up for assembly operations and have used this information from the field almost wholly for the design of jigs and fixtures for core assembly, core-setting operations and final casting inspection.

The work of our chief inspector in the field has become one of our best customer-relations activities. From his study of our castings in customers' plants and by closely following up the findings and recommendations of our chief inspector, we have established excellent low-rejection records in the field which are more important than maintaining a low scrap loss in the foundry, although both are obviously desirable.

Analysis of Cost of Losses—In order that the quality control program be kept moving in the direction of the greatest cost savings, we inform our operating supervision of the cost of the scrap loss by giving them a breakdown of the operating costs, profits as determined at the shop level and the cost of each individual casting when it is ready for shipment.

This cost analysis for the preceding week, which includes the total cost of the scrap losses and a breakdown by each pattern number, is discussed once each week in a meeting at which all operating supervision is present. The relationship between shop profits and the cost of this scrap loss has taught us to think in terms of money loss rather than of per cent of scrap loss by weight.

If, for example, a heavy pulley or flywheel is running at a five per cent loss as compared with a transmission case or a heavily-cored type of casting at the same percentage of loss, the losses in the latter two castings usually would be the more expensive to the foundry operation. Hence, immediate action should be taken on the castings which are causing the most loss in shop profits rather than on reduction of the per cent loss by weight of all castings.

It is imperative in any foundry quality control program that those people actively engaged in supervising production be kept informed of all operating costs. A reduction in these costs is the direct objective of the quality control program.

Cleaning Costs as a Starting Point—A study of foundry cleaning costs is also an excellent place to begin to set up procedures for the control of quality in the castings. Careful investigation of the cleaning operation for work simplification will point out those conditions which will lead back through molding and core sands, mold and core washes, gating and risering, cupola melting, pouring temperature and the equipment used to make the castings.

The elimination of unnecessary fins, for example, or the adjustment of the thickness and position of the fins usually will end in a complete setup for core-assembly fixtures, core-setting fixtures, pins-and-bushing maintenance, cope close-up equipment and a thorough study of the core sand mixtures to eliminate sagging and to control baked core dimensions. Elimination of fins will also demand a study of molding sands and ramming equipment.

One of the more expensive items involved in cleaning costs is penetration. It is obvious that the elimination of this sand and/or of ramming defect will involve a study of molding sands, core sands and molding machines and will indicate the necessity for a full scale sand control operation.

Excessive chipping of gate and riser scars or cost of removal of sprue requires a fundamental study of the size of risers, riser connections and gates to reduce this cost. A study of this type will automatically improve the yield in any foundry operation.

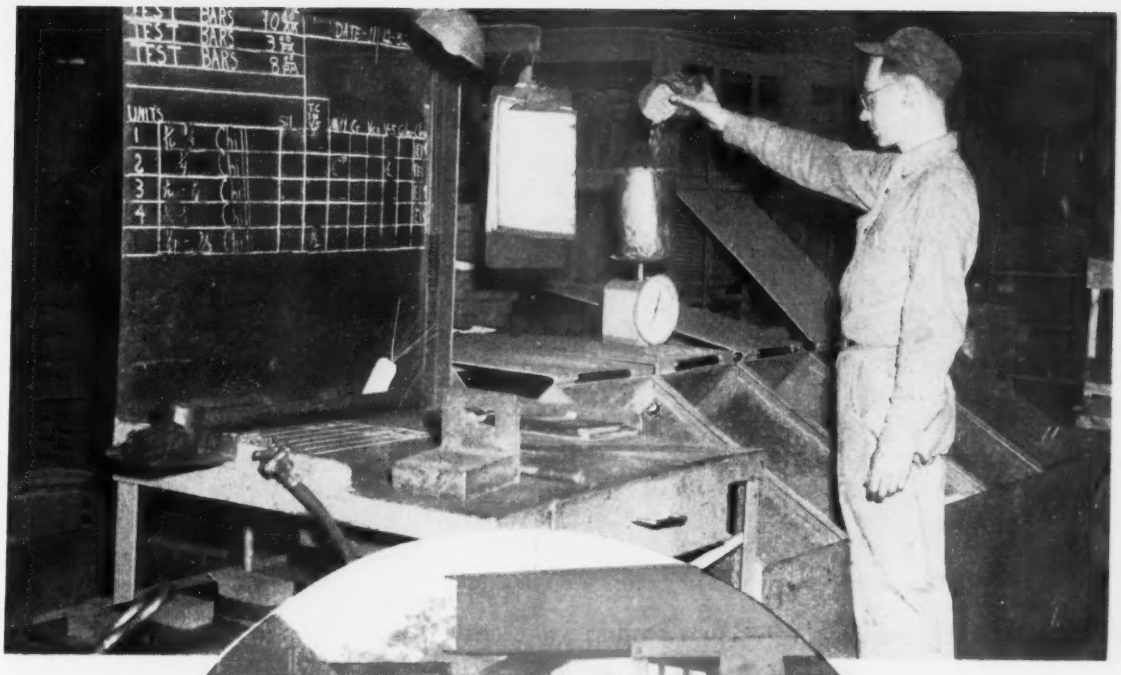
The cleaning room is cited as a second starting point for furthering a quality control program because, generally, the cost of scrap losses in the foundry and in the field is greater than the expected reduction in cleaning costs by the introduction of quality control methods from this base. There is, however, no reason why both programs may not proceed simultaneously.

Chill Test for Metal Control—Much has been written by many investigators on the use of the chill test, and the importance of their findings should not be minimized. We use the chill test extensively, and it is a very effective tool in the quality control program of our foundry.

The literature published concerning the chill test may, in some respects, discourage foundries from its use; however, a chill test which has been carefully correlated with the physical properties of the metal in the castings being produced is a desirable tool. Certain precautions should be taken in the design and procedures for obtaining a chill test, and attention is directed to the following:

1. The chill test should be designed in such a way that a gray-white fracture is available for observation. Obviously the design of the chill test is dependent therefore on the composition of the metal which the foundry is pouring.

2. Our findings to date indicate that a chill test should be made in a dry sand mold, poured on a water-cooled block, poured at the same rate from sample, poured from the same gating position, poured in the same range of temperature (2450-2550 F). A hot, dry sample ladle should (*Please turn to page* 214)



Careful weighing is necessary in making late alloy additions to cupola metal

This group studies each day's accumulation of defective castings to determine causes and cures

Measuring wall thickness on a production casting in the inspection department

choosing *the right* copper-base alloy

Qualities desired in a casting will dictate the selection of the alloy to use, but a compromise must be made in some cases. The author offers recommendations on different types of alloys for various applications

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THE first question that arises when the nonferrous foundry has a choice in the type of copper-base alloy to use for a particular job is: What inherent qualities are desired in the casting? These may include bearing quality, shock resistance and peenability, wearing quality, anticorrosion, ductility, or pressure tightness. Any one or any combination of these qualities may be required.

One cannot have the optimum condition for all the characteristics in the same alloy, and in general it is necessary to sacrifice to a certain extent even some of the qualities desired in order to obtain the maximum for the quality deemed most important.

Before dealing with specific requirements it may be well to say that there are two metals whose presence is frequently objected to, even in amounts up to 3 per cent, but which in the writer's opinion are not inimical to the quality most desired. For instance, zinc sometimes is said to be entirely unsuitable as a component of alloys used for acid-resisting purposes. The writer's experience is that zinc up to 3 per cent does not adversely affect acid resistance, providing the rest of the alloy is suited to the purpose. On the contrary, the presence of zinc gives a better alloy as to freedom from gas, and finer grain size, both of which aid pressure and corrosion resistance. An outstanding example of the benefit of 3 per cent zinc is for bronze that is subsequently babbitted. Without zinc the babbitt will not adhere properly to the bronze, but with it no difficulty is experienced.

The addition of lead is often considered to greatly reduce the hardness, whereas actually its effect, when present in the amount under discussion, is very small. Lead undoubtedly facilitates the flow of cooling metal in its attempt to fill up the dendritic spaces produced during solidification, thus making for a pressure-tight metal. However, the presence of lead in alloys intended for heat treatment may be extremely objectionable.

Let us now turn to specific uses of alloys.

Bearings—A common assumption is that a chill-cast alloy is better than a sand-cast one because of the greater density and finer grain of the former. This loses sight of the fact that where lubrication depends on the maintenance of an oil film, it will be found that the less dense or more porous sand cast metal is definitely superior. Sand-cast metal will actually absorb a definite though small amount of oil, whereas the chill-cast metal will not. If the conditions under which the bearing is used include the possibility of failure of the oil film altogether, then the presence of lead acts as a stop gap during which warning may be given by the rise in temperature of the bearing or odor of heated lubricant. For such purposes lead should be present in considerable amounts, depending on the specific case. An excellent general bearing alloy is one of the composition tin 7, lead 15, zinc 3, copper remainder.

Peening Quality—Probably no requirement is harder to meet than peening quality, which is a special form of shock resistance. Good peenability means that under hammer blows the metal will deform readily without developing any cracks at the edges, while at the same time having a high deformation factor. Riveting is a good example.

Requirements for such an alloy are a high rating as indicated by the Izod test, and a high elongation—a figure of 60 ft-lb for the former and 60 per cent for the latter will give good results. A low-silicon-content silicon bronze meets these requirements.

Wearing Quality—This is too often associated with hardness and, in fact, this quality is difficult to define accurately. We are faced with such inconsistencies as the sharpening of the hard steel razor blade by rubbing on soft leather, or the sharpening of augurs on a lead-banded wheel. Toughness seems to be one of the requisities for good wearing quality and this is associated with the Izod figure. There have been extreme cases where sheet lead has withstood the impingement of such material as wheat grain better than harder metal.

If the writer were to be confronted with a wear problem in which a hard alloy had failed, he would turn to one of only medium hardness but with considerable ductility; it should be remembered that these factors are not incompatible. Two good wearing alloys are the Ni-Vee L-O-HT, composition—nickel 5 per cent, tin 5 per cent, zinc 2 per cent, copper 88 per cent, phosphorus 0.05 per cent, heat treated by soaking for 5 hr at 1400 F and oil quenching, followed by soaking for 5 hr at 550 F and cooling in air—and the low-silicon, silicon bronze in the as-cast condition.

Anticorrosion Quality—In considering this quality great care must be exercised. No test is as good as one carried out under actual working conditions. Differences in temperature of the corroding medium, or variations in the percentage composition, together with the presence or absence of air, all greatly affect the degree of attack on any one alloy. However, it may be said that a small crystal or grain size, with the aggregate as uniform as possible, is the best for resistance to corrosion.

A test sometimes applied in this connection is the "deep etch test"—that is, immersing the specimen after processing it with coarse and then finer emery paper, in a mixture of one part by volume of hydrochloric acid, two parts of nitric, and one part of water. If the specimen is immersed for a few seconds only and washed with water the crystals may seem to be well knit together, but continued immersion for ten minutes may disclose areas of preferential attack. (This is a characteristic of uneven sized crystals). Such a metal is not suited to the requirements of acid resistance.

Ductility—This is closely associated with elongation although the two terms are not synonymous. Here a vital matter is often overlooked in considering the figure for percentage elongation. True elongation should mean that the test bar failed at only one point—namely the breaking point. In general, specifications do not insist on this, being satisfied with the increase in distance between the two 2-in. punch marks when the broken bar is fitted together as closely as possible, and ignoring the presence of several incipient fractures that have appeared at various points on the test bar, the sum total of which make up the "elongation."

To meet the requirements of true elongation metal must be as free as possible from gas, oxides and extraneous matter such as sand or slag. The crystal size need not be small or uniform so long as the crystals are well knit, as indicated by the "light etch." Low-silicon silicon bronze is again one of the alloys to give the highest elongation figure as cast. The nickel bronze Ni-Vee L-O composition also gives a high elongation figure as cast.

Pressure Tightness—This demands a closely knit crystal structure but not necessarily a small and uniform grain. However, alloys that have a uniform grain size as fractured in a 2-in. cross section are to be preferred to those that have a chill effect next to the mold. Such alloys as silicon bronze, aluminum bronze, and manganese bronze meet this requirement, and will give a pressure-tight casting even when both outside and inside layers of metal have been removed.

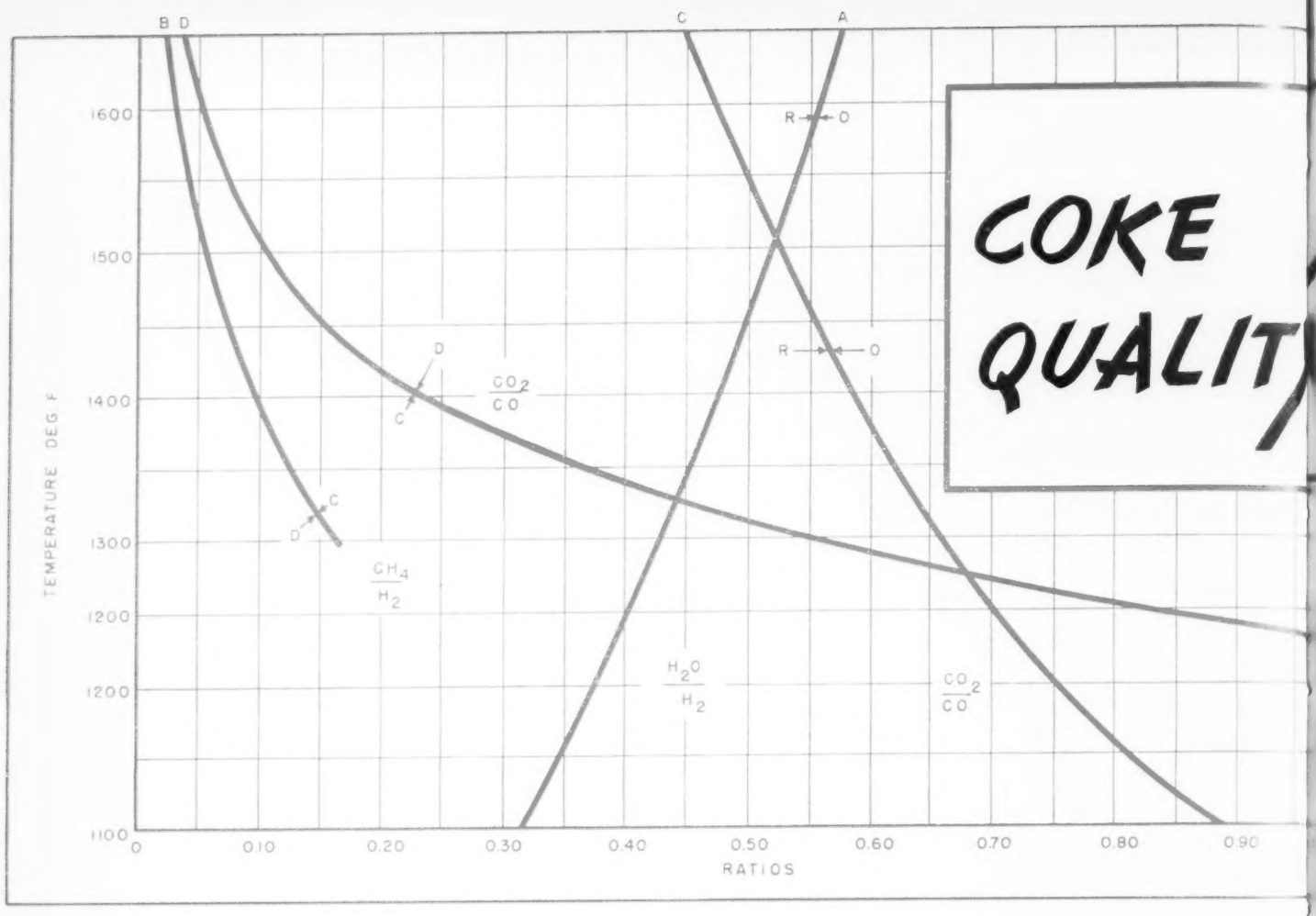
Another alloy, while it does not meet the requirement of freedom from chill areas next to the mold, still gives excellent results for pressure work even when the inner and outer surfaces are machined off, although still more dependable results are had when there is no machining; it has a composition of tin 7 per cent, lead 15 per cent, zinc 3 per cent, copper remainder. This alloy is the most foolproof of any the writer has used, so far as casting quality is concerned, but naturally there are conditions for which it is not suited.

So much for theory. The foundryman wants to know how he can decide which alloy to use and in what manner the metal must be handled to get the best out of it.

If the foundryman is left free to choose the alloy to be used it is assumed either that the customer has supplied certain physical requirements or, if this is not the case, then the foundryman probably has asked the customer for details as to the conditions of use. In either case the choice must be made after taking into consideration the various factors suggested here. The "casting" or "founding" quality of the alloy merits serious consideration. Better results may often be secured by using an alloy with which the foundry is well acquainted, rather than going into a new field of experimentation.

If a chemical specification is provided by the customer the foundry has only to melt and pour this metal under optimum conditions, which at the risk of being hackneyed may be summed up as follows:

1. Buy high-class composition ingot.
2. Use nothing else save *clean* gates and risers from previous castings of the same alloy.
3. Melt under a slightly oxidizing atmosphere.
4. Melt as rapidly as possible.
5. If tin bronze is used, treat with Walpole flux followed by phosphor copper.
6. Pour at as low a temperature as possible and at a rate that will permit the molten metal to fill the mold and at the same time to follow the principle of progressive directional solidification. This temperature and pouring rate is a function, not only of the alloy used, but of the particular casting being poured.



COKE QUALIT

Fig. 1—Equilibrium rates of CO_2 CO mixtures for carburization/decarburization and for oxidation/reduction as a function of temperature. Data for CH_4/H_4 are included

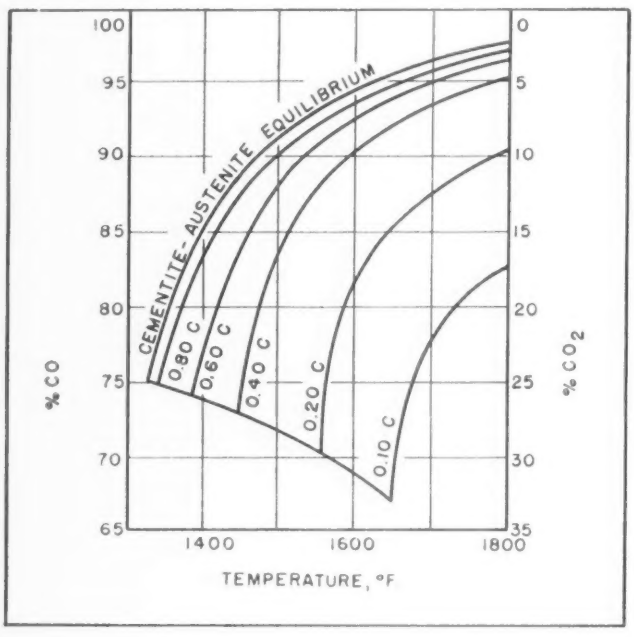


Fig. 2—Curves of equilibrium of CO/CO_2 mixtures, in contact with steels of different carbon content, as a temperature function

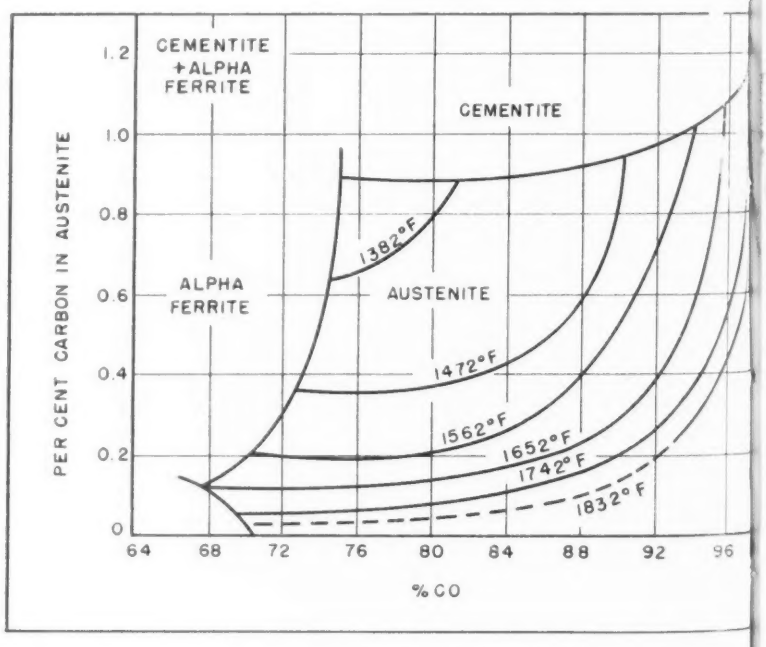


Fig. 3—Curves for the equilibrium of CO content in CO CO_2 gas mixtures at different temperatures as a function of the carbon content of the steel

CARBON PICKUP

The author describes tests intended to evaluate the behavior of coke in the cupola, particularly with regard to its carburization power or the facility with which the carbon passes into solution in molten iron

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SUCCESSFUL cupola operation is dependent on many factors, including the character of the coke used in the charge. Many tests available for determining coke quality may be grouped under the terms physical properties, chemical properties and thermal properties. All of these provide some guide as to the probable behavior of the coke in cupola operation.

In practice, however, none seems to furnish a definite index of the rate at which carbon will be taken up from the coke by the charge as it progresses down toward the melting zone and finally reaches the well as liquid iron.

The term "coke reactivity" has been used to designate the facility with which carbon may be given up to the solid or liquid iron, but there is no test available which seems to measure this property. Furthermore, we do not yet have conclusive evidence on the sequence of carbon pickup in any quantitative sense as the solid charge at the cupola door passes down the stack and finally assumes the liquid state.

The variation in postwar coke available to the foundries focused attention on this matter and made it particularly desirable to examine the possibilities of developing some method of obtaining an index of the behavior of coke in the cupola from the viewpoint of: 1. Developing maximum temperature of melting. 2. Estimating relative carbon pickup by the charge.

The tests to be described relate more particularly to carbon pickup or the carburization power of a coke and provide data on several different cokes pertaining to:

1. Carburizing power for solid iron at temperatures below that at which melting can occur.

2. Carburizing power for liquid iron at temperatures approximating 3000° F.

Cokes Investigated—Several types of cokes were investigated. These included:

a. By-product—Size 2 to 6 in., S 0.65, C 89.9, ash 8-10, VM 0.50. Received as crushed coke passing through a ¼-in. and held on a ⅓-in. screen.

b. Beehive—72-hour foundry coke. Size 2 to 6 in, ash 9.50 VM 2.10, S 1.11.

c. By-product—Size 3 to 8 in., ash 9.62, VM 0.87, S 0.74, moisture 0.17, FC 89.34.

d. Pitch coke—Size 4 to 10 in. long, ash 0.6, VM 0.7, S 0.4 moisture 0, FC 98.9. Method of manufacture is the same as that for beehive coke except that pitch is used instead of coal.

e. By-product—Size 5 to 7 in., coking time 19 hours, ash 0.2, VM 0.50, S 9.64, moisture 0.55, FC 90.3.

f. Mexican graphite No. 8.

Carburizing Power for Solid Iron—Materials described were used in tests comparable to the standard method known as "carburization" in the steel industry. In this process a low-carbon steel is placed in a pot surrounded by the carburizing medium. A cover is then luted with clay, and the charge heated for several hours at 1600 to 1700° F to promote surface carburization.

The carburizing media used are essentially some form of carbon to which an "energizer"—usually barium carbonate—has been added to speed up the rate of carburization and to increase the carbon content which can be obtained in the steel.

Fundamentals of Carburization—Carburizing processes are generally classified as (1) pack carburizing, with solid carburizers and (2) gas carburizing. It might be thought that in pack carburizing the iron or steel would be carburized by direct contact with the solid steel but evidence indicates this unlikely so that both methods are essentially gas-metal interface reactions.

Accordingly it may be assumed that the solid carbon forms carbon monoxide (CO) which is the agent that actually carburizes the solid iron or steel. Thus, carburization can occur only in the presence of oxygen according to the well known simple reactions between C, CO, CO_2, Fe, and O.

These reactions make it clear that only limited amounts of oxygen are necessary and even desirable for maximum carburization in any closed system. A

carbon monoxide atmosphere must be initially generated. This gas is then oxidized to carbon dioxide (CO_2) when carbon is given up to the steel, at which stage further carburization would cease except for the presence in the system of solid carbon which permits the reaction $CO_2 + C \rightarrow 2CO$ to take place with the regeneration of CO. This cycle proceeds over and over again as the steel progressively picks up carbon until equilibrium is attained. It is this "equilibrium condition" which must receive further discussion.

From what has been said, it is evident that at any given temperature all three phases CO, CO_2, and C are co-existent. There is, however, always present an excess of the solid carbon so that we are concerned only with the relative amounts of the two gases CO and CO_2.

The ratios of these gases are dependent on temperature as shown in Fig. 1, where the equilibrium curve divides the figure into two regions. Consider the temperature level of 1400° F. So long as the CO_2/CO gas ratio is less than about 0.2 (CO_2 content less than 20 per cent), the mixture is carburizing and carbon passes into the steel. At 1300° F the concentration of CO_2 must be less than 60 per cent (0.6 ratio) for the gas to be fully carburizing.

At higher temperatures like 1700° F it may be noted from Fig. 1 that when the CO_2 content exceeds about 7 per cent the gas is decarburizing in relation to carbon saturation of the steel. This clearly indicates that in cupola operation to effect full carburization power at temperatures short of the melting zone very little CO_2 must be present or alternatively the CO content must be considerably higher than 95 per cent.

Steel Is Saturated with Carbon

Consider what happens at 1700° F (a common carburizing temperature in industry) with the equilibrium for CO_2/CO in presence of excess carbon such that the mixture will contain 7 per cent CO_2 and 93 per cent CO. In this the steel will be just saturated with respect to carbon and will contain about 1.25 per cent carbon in solid solution.

Assume now that equilibrium is not attained either because excess oxygen is present (as in cupola operation) or because the carbon (coke) is slow or reluctant to build up the high CO content (a measure of reactivity) for equilibrium. In such case we may have 46 per cent CO which is only half the equilibrium concentration. The mixture may be said to be half saturated with respect to carbon and the steel will ultimately reach a point of half saturation with 0.6 per cent carbon dissolved in the solid iron. Similarly a steel containing 1.0 per cent carbon, when held in an atmosphere of 46 per cent CO and 54 per cent CO_2 at 1700° F, will have the carbon content reduced to approximately 0.6 per cent.

Two types of curves show specific relationships between the three variables CO_2/CO ratio, carbon content of steel, and temperature. The first (Fig. 2) shows curves for varying carbon contents plotted on temperature—per cent CO coordinates. Consider the curve for a steel carburized to 0.8 per cent C. This degree of carburization can be effected at 1400° F with only 77 per cent CO in the mixture whereas at 1800° F the curve indicates that the CO content must

TABLE I—Results of Carburization Te (He

NO.	COKE SAMPLE	VOLATILES	CARBON	
1600° F				
1	by-product (a)	much	——	Much
2	by-product (a)	none (used coke)	——	Much
1800° F				
3	beehive	little	——	Marke
4	by-product	little	——	Marke burize
5	by-product (a)	none (used coke)	0.214	Some burize
6	by-product (c)	none (used coke)	0.155	No g carbur
7	beehive	none (used coke)	0.143	No de
8	pitch coke	some	——	Marke
9	pitch coke	none (used coke)	0.134	Appar
10	Mexican graphite #8	little	0.216	Marke
11	anthracite	much	——	Appar

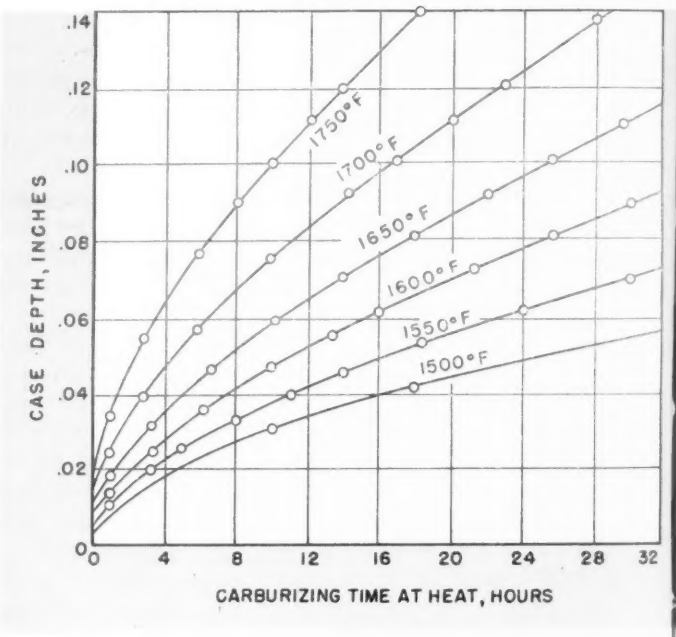


Fig. 4—Curves showing carbon concentration gradients (depth of case) for different carburizing temperatures as a function of carburizing time

approximate 97 per cent CO. Alternatively if the gas contains only 75 per cent CO at 1800° F, the steel will contain much less than 0.1 per cent C—the lowest carbon content curve included in the figure.

The second (Fig. 3) includes curves for varying temperatures plotted on per cent C-per cent CO coordinates. These curves emphasize the need for higher CO concentrations in the CO_2/CO mixture to obtain any given degree of carburization of the steel as the temperature of reaction is progressively increased. Thus to obtain carburization up to 0.6 per cent total carbon the CO content at 1470° F should

(Held for 4 hours at 1600 or 1800° F)

	COMMENTS ON METALLOGRAPHY
——	Much decarburization except at specimen center
——	Much decarburization except at specimen center
——	Marked decarburization except at center
——	Marked general decarburization with slight peripheral carburization
0.214	Some center decarburization but band of peripheral carburization
0.155	No general decarburization with band of slight peripheral carburization
0.143	No definite evidence of carbon loss or carbon pickup
——	Marked decarburization. Seal broken open
0.134	Apparent slight carburization
0.216	Marked evidence of carburization
——	Apparently little general carburization

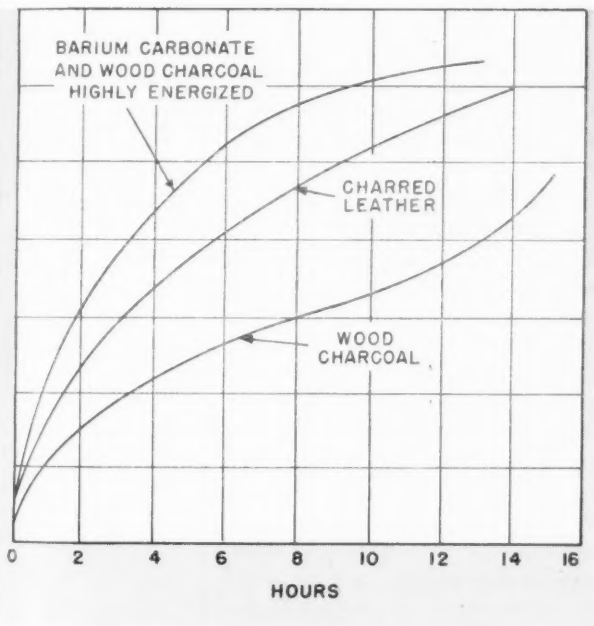


Fig. 5—Curves showing carbon concentration gradients (depth of case) for different types of solid carburizing media as function of carburizing time

be about 88 per cent, whereas when the carburization temperature is increased to 1830° F a CO concentration of about 97.5 per cent is needed to yield a similar degree of carbon pick-up by the steel.

These data relate to equilibrium conditions at the gas-metal interface. In actual practice, the peripheral parts of the iron attain these carburization values and the steel is only fully carburized if adequate time is given for diffusion to move to completion. Prior to this condition, a carburized case depth is obtained which serves as a measure of carburization penetration. The relation of this case depth to both carburizing time and temperature is indicated in Fig. 4.

Thus it will be observed that interchange of carbon between the CO_2/CO gas mixture and the steel is a slow process, but this rate can be used as a measure of the facility with which the carbonaceous material provides high CO concentration in a C-CO_2-CO system. It serves as a measure of the "reactivity" of the carbon-bearing solid phase within the temperature ranges at which the steel or iron is still in the solid state.

To assure the validity of this procedure as an index of reactivity it is necessary that: (a) The temperature remain the same in the series of tests. (b) The time factor remain constant. (c) The size of the coke and details of packing remain constant. (d) The sealing of the container forming the closed system remain constant, particularly as regards ingress of air (O) which tends to promote a high CO_2 content.

Tests to be described, along with details of the results obtained provide an index of the carburizing potency of the cokes examined with respect to solid steel charges passing down the cupola stack toward the melting zone.

In the commercial carburization of steel, an "energizer" is essential if a high-carbon case, approximating maximum theoretical carbon pickup, is desired; its importance is illustrated from the curves given in Fig. 5. The vertical ordinate is the same as in Fig. 4 and the temperature was 1650° F.

Since we are concerned only with a measure of the tendency for carbon pickup from coke as used in the cupola, no energizer was added and consequently the carbon pickup to be anticipated will be well below the theoretical equilibrium value. However, the degree of carburization should serve as a measure of the tendency of the coke to give up carbon to the CO_2/CO gas system and hence to the steel sample. It has been assumed that this affords some measure of the "reactivity" of the coke in the temperature limits investigated.

Solid Carburizing Tests—With the exception of one sample of by-product coke the samples received were of a size suitable for regular cupola operation. Pieces were crushed to pass through a $\frac{1}{4}$-in. and held on $\frac{1}{8}$-in. screen to provide a sample which would pack well around a $\frac{1}{2}$-in.-diam, 3-in.-long steel rod to assure intimate contact. Same sample was used in any repeat heats desired since all volatiles had been eliminated and it was unnecessary to break the seal to permit gas escape from the carburizing chamber.

Pack carburizing was conducted in a silica tube 4 in. ID and 10 in. long sealed at one end. The low-carbon steel rod was placed in the center of the tube and packed with the coke granules. A silica plate was used to cover the charged tube and sealed with fire clay and porcelain cement.

A thermocouple placed adjacent to the steel specimen permitted a direct check on temperature throughout the test. The silica tube was placed in a muffle furnace, heated to the desired carburizing temperature, and maintained at constant temperature by use of a Foxboro control unit. Assembly is shown in Fig. 10.

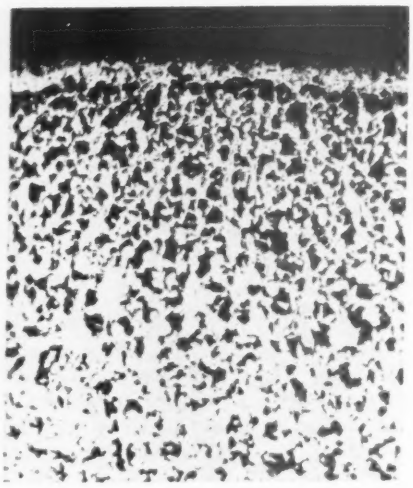


Fig. 6—By-product coke (a) at 50X

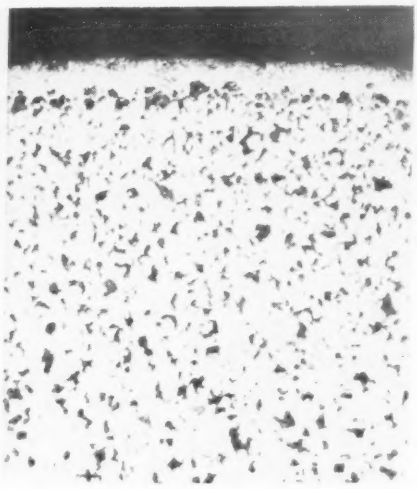


Fig. 7—By-product coke (c) at 50X

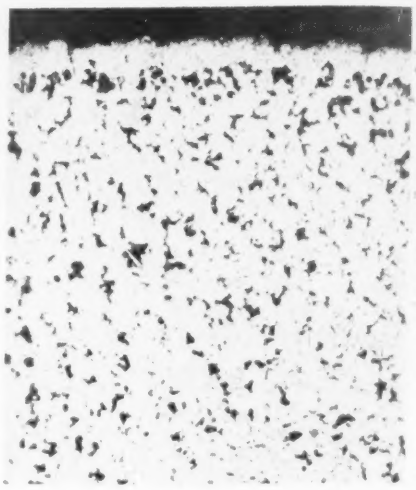


Fig. 8—Beehive coke at 50X

Two tests were run at 1600° F using by-product coke No. a. (The letter "a" refers to the type of coke in the earlier listing of cokes investigated.) All the remaining tests were conducted at 1800° F—the maximum operating temperature of available furnaces—with a constant holding time of 4 hr at temperature.

With the first three tests the furnace was shut off and cooling took place in the closed furnace. Thereafter, following the 4-hr holding period, the furnace was shut off, the door opened and the silica tube withdrawn to the position shown in Fig. 10. Under these conditions the rate of cooling was about 600° F per hr.

When cold, the sealed cover was removed and the steel specimen sectioned for metallographic examination. It was also milled across the complete transverse section for analysis for total carbon.

When the sample of coke was initially used, the volatile matter was allowed to escape and burn during the heating up period after which any leaks around the silica plate were sealed up. On re-use no allowance for escape of volatiles was, of course, necessary.

Results of tests in terms of carburization have been condensed in Table I. With the first two tests, run at 1600°F, the seal was not completely effective and some infiltration of air probably took place during this run and subsequent cooling. This statement is also true of runs numbered 3 and 4 prior to the use of a liquid porcelain cement being brushed onto the base clay used for heating purposes. Accordingly, chemical analyses were obtained only on subsequent runs. The carbon content of the bessemer screw stock used for the steel test samples was 0.138 per cent.

From Table I, it can be noted that the total carbon pickup was greatest when using by-product coke No. a or the Mexican graphite for carburizing at 1800° F for a period of 4 hr. Values for total carbon of 0.214 and 0.216 per cent were obtained or an increase of 0.075 per cent.

The use of by-product coke No. c resulted in a total carbon of 0.155 per cent or a pickup of only 0.015 per cent and the beehive coke and pitch coke showed somewhat lower values than that—0.143 per cent each.

Values listed, however, represent the averages of carbon pickup for the sample although the increase in carbon is concentrated in the peripheral parts of the ½-in.-diam test sample.

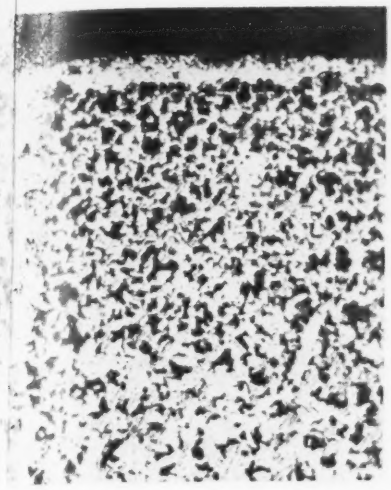
This is illustrated in Figs. 6 to 9 inclusive which show the appearance of the etched microstructures at 50 diam, after carburization at 1800° F for 4 hrs, using by-product coke No. a, by-product cake No. c, beehive coke and Mexican graphite. The relatively high concentration of carbon near the surface of the specimens treated in coke No. a (Fig. 6) and in Mexican graphite (Fig. 9) is clearly indicated. The dark areas are unresolved pearlite and the white areas are free ferrite. The structures would indicate a maximum carbon concentration (in the form of carbide as a constituent of the pearlite) of about 2/3 per cent.

The extreme edge, approximating 0.1-in. on the micrograph, (actual 0.002-in.) represents a decarburized zone which forms during cooling of the specimen. Both these test bars (by-product No. a and Mexican graphite) showed an average carbon content of about 0.215 per cent.

Clearly carburization has occurred to only a very limited degree with the by-product coke No. c (Fig. 7) and carbon pick-up from the beehive coke has been so meager that it is difficult to determine from the structure whether or not any appreciable increase in total carbon has resulted from the 4-hr treatment at 1800° F (Fig. 8). Actually the mean carbon con-

TABLE II—Carburization Tests at 3000° F

Coke Sample	—Holding Time— 30 min. % C.	5 min. % C.	Average Carbon Content After 4 Hours at 1800°F
By-product (c)	4.87	2.43	0.155
Beehive	5.19	2.33	0.143
Pitch coke	5.18	3.52	0.134
By-product (c)	4.77	——	——
By-product (e)	5.19	2.69	——
Mexican graphite #8	——	4.41	0.216



Figs. 6-9 — Views of etched structures of steel after they have been subjected to carburization in different cokes for 4 hours at 1800° F temperature

g. 9—Mexican graphite at 50X

tent has been raised from 0.138 per cent (bessemer bar stock) to 0.143 per cent.

All sections exhibit the decarburized zone, on the extreme periphery of the bar, which has occurred during the cooling cycle.

It may be considered that the micrographs rather than the chemical analysis for total carbon present a record which emphasizes more markedly the variation in tendency of the different cokes to give up carbon to solid iron at a temperature of 1800° F.

Carburizing Power with Liquid Iron—Since it is generally accepted that most of the carbon pickup in cupola operation takes place in zones where liquid iron is available, whether in the form of droplets descending the stack or as a liquid aggregate in the cupola well, some tests were made to serve as an index of coke "reactivity" for liquid iron. For this purpose, cast iron (Armco) was melted in a crucible and held at temperature for a given time while in contact with one of the several cokes investigated.

The iron was melted in a magnesia pot 3½ in. in diameter and 6½ in. deep by use of a high-frequency 25-kw unit. The power used to melt the charge was 22 kw after which the power was reduced and an effort made to maintain a temperature of 3000° F. A check on temperature was available through the use of an optical pyrometer but the nature of the tests excluded pyrometric temperature control.

After completion of the test, the melt was poured into a steel mold and a suitable section cut for total carbon analysis, using a high-speed cutting disk wheel. The samples were too hard to permit taking drillings. Two series of tests were run which will be described separately.

Series I—A layer of ½-in. sized coke about 1½-in. deep was placed in the bottom of the magnesia crucible, some iron (Armco) added and then coke placed on top of the charge. After part of the iron was melted, further pieces were added and covered with coke until the melt was completed.

The melt was held at approximately 3000° F for 30 minutes during which time the coke was manually pushed below the top surface of the melt using a ⅛-in. iron rod. The melt of iron weighed 10 lb, and was immediately chilled by pouring into a 2-in.-square iron mold. Melts were made as just described using: By-product No. c, beehive, pitch coke, repeat of by-product No. c and by-product No. e.

Series II—Five lb of Armco iron was melted down in the magnesia crucible. The melt was then deoxidized with four small pellets of aluminum and the surface of the iron immediately covered with a layer of ½-in. sized coke. A temperature of approximately 3000° F was maintained for 5 minutes and the iron was then poured in the steel mold.

For the test with Mexican graphite the only variation was in size of the carburizing medium—8-mesh which is fine flake graphite.

Results of Tests—All the test irons were white and contained much massive free cementite with a pearlitic matrix and complete absence of flake graphite. Carbon by combustion was run on pieces cut from the ingots with the results shown in Table II. In this table have also been included the carbon determinations obtained from the bessemer screw stock subjected to gaseous pack carburization at 1800° F and held for 4 hr. The results are very interesting since they appear to provide the desired index from which to form an estimate of the relative carburizing power of the various cokes.

Consider first the results (*Please turn to Page* 234)

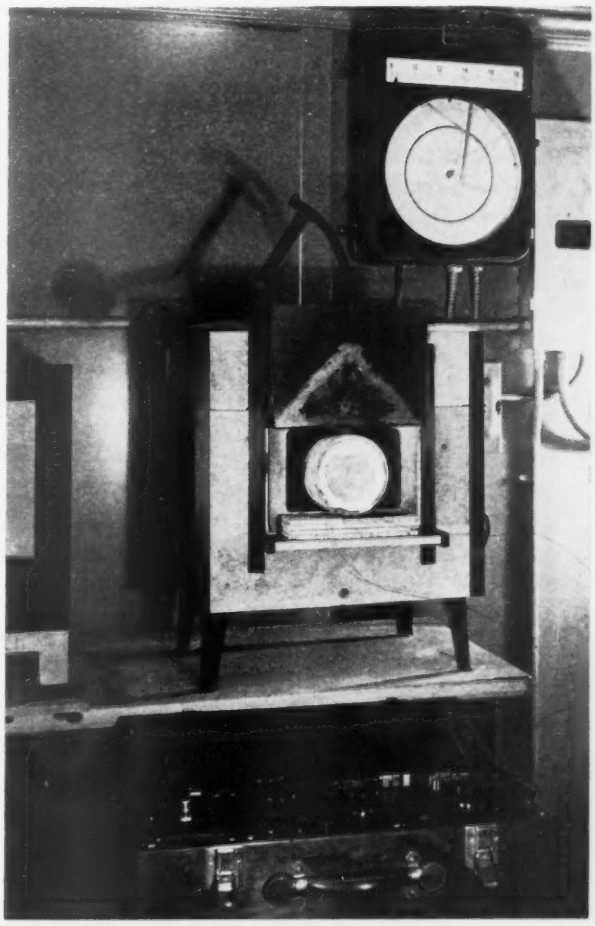


Fig. 10—Details of experimental method of determining relative carburizing power of various cokes for solid iron at constant time-temperature conditions

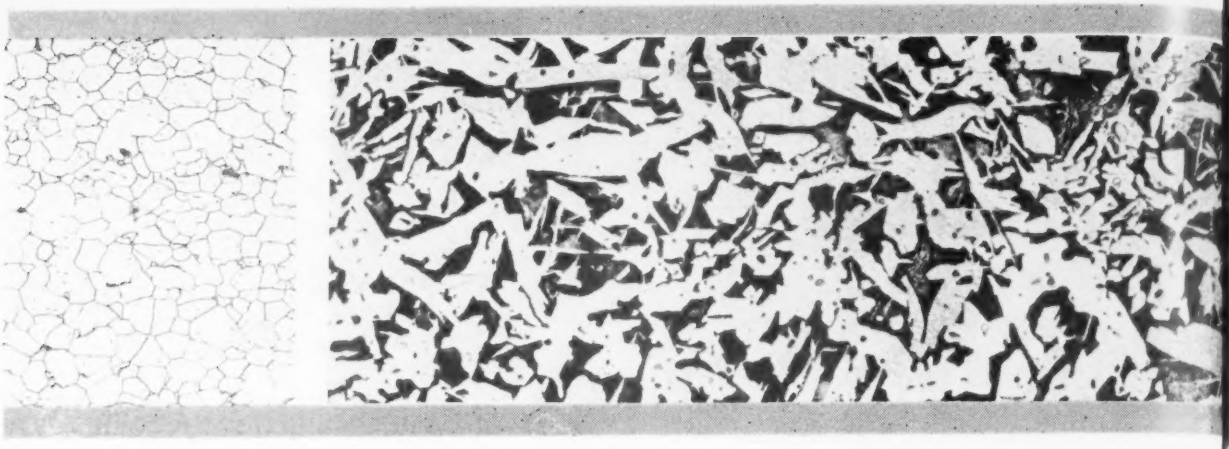


Fig. 1—Ferrite at magnification of 100X. From *Modern Metallurgy for Engineers* by Frank T. Sisco

Fig. 2—Ferritic network appears light in as-cast structure of 0.24 per cent C steel seen at 200X

HEAT TREATMENT OF STEEL

In this first of three articles describing heat treating practice in the steel foundry, a discussion is presented of changes which occur in the metal's structure in improving mechanical properties

AS A RULE, different portions of a single steel casting vary widely in thickness, and therefore solidify, cool and contract at different rates. The unequal contraction sets up heavy stresses in the several parts of any but a very simple piece.

In extreme cases, large and complicated castings will break completely in two, with a noise like a cannon shot, if they are allowed to cool in the air to atmospheric temperature. To reduce these contraction stresses as much as possible, such castings are left in the molds until they have cooled below red heat. They are then rough cleaned as rapidly as possible, placed in the annealer, brought to a uniform red heat, and allowed to cool slowly and evenly to low temperature.

Years ago, heating and cooling in this way to relieve stress was thought to be the principal object of annealing as then practiced, and current definitions still recognize it as one form of heat treatment. It does not, however, produce the changes in the internal structure of the metal that must be brought about if the steel is to develop its best mechanical properties. To accomplish this, most steel castings today are subjected to more drastic forms of heat treatment that cause marked changes in their physical structure, and thereby greatly improve their strength and toughness.

The internal structure of steel is revealed by examination, usually under the microscope, of a polished cross section of the metal, after it has been etched. The study of macrostructures and microstructures thus revealed is one, though not the only, function of the metallographist. The science of metallography is a study in itself, has a most extensive literature, and can be covered here in only the barest outline. Without at least a working knowledge of the subject, however, it is impossible to understand the basic principles of heat treatment.

To examine the structure, the metallographist first prepares a specimen of the steel, generally not over 1 inch cube, and polishes one or more of its flat faces on abrasive cloths or papers of increasing fineness until it is brought to a mirror surface. The polished face is then subjected to the attack of a weak acid or some other corrosive agent, washed clean and dried in a stream of dry air. The etching agent attacks the several constituents unequally, so that they can be distinguished by examination under the microscope, or in some cases with the naked eye. If only one constituent is present, as in the case of carbonless iron or some of the nonmagnetic high-alloy steels, the acid or other corrosive agent attacks, and thus reveals, the boundaries between adjacent grains.

Pure iron consists of crystals of what is known as *ferrite*, which is but slightly attacked by the usual etching agents, except at the grain boundaries. Its appearance under a magnification of 100 diameters is shown in Fig. 1. Ferrite is comparatively soft and ductile, of low strength and high resistance to impact, and under static load will stretch as much as 50 per cent before breaking.

Carbon in ordinary steels exists as *cementite*, the carbide of iron, whose chemical formula is Fe_3C. It contains 6.67 per cent carbon, is glass-hard and brittle.

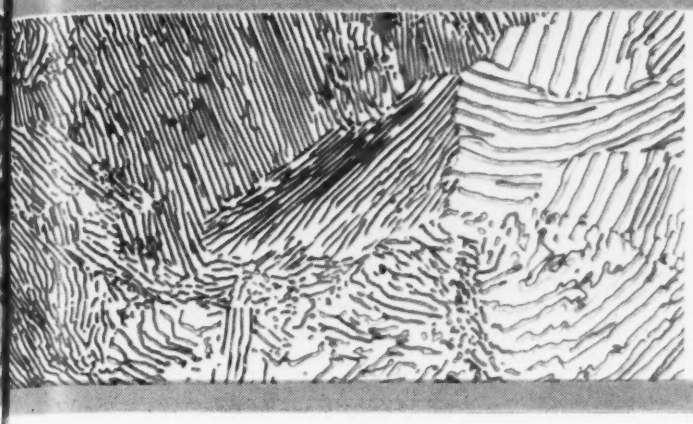


Fig. 3—Pearlite presents different appearance at 1000X. Prepared by J. R. Vilella, U. S. Steel Corp.

CASTINGS

By JOHN HOWE HALL

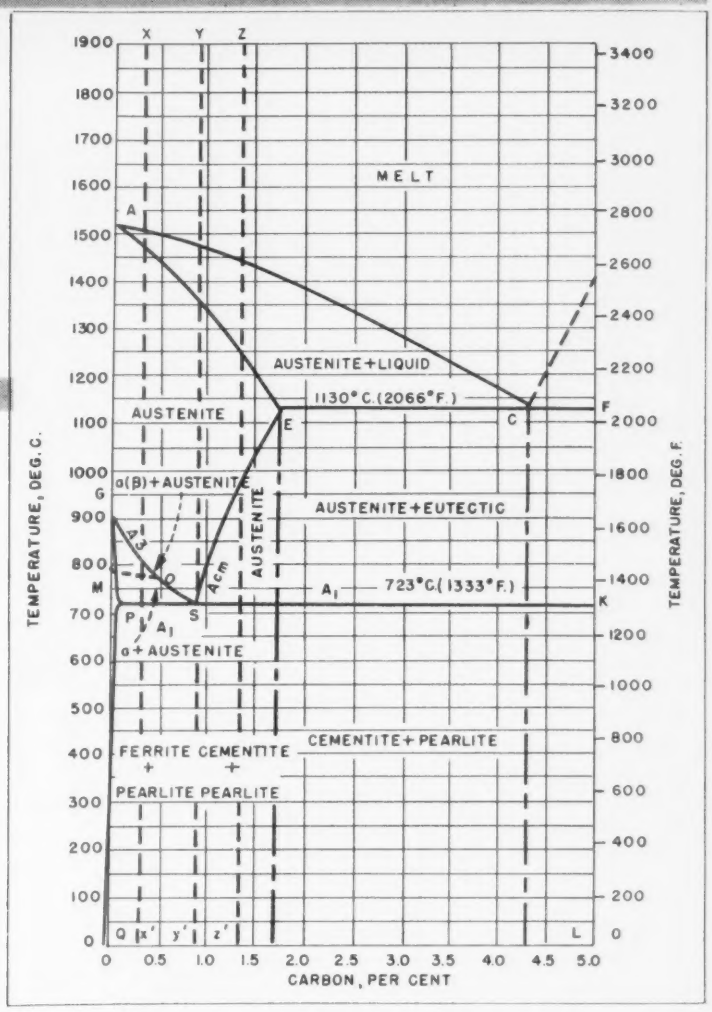


Fig. 4—Carbon-iron equilibrium diagram. From *Modern Metallurgy for Engineers* by Frank T. Sisco

It is not attacked by weak acids, but appears shiny white under the microscope. With other etching agents, such as boiling sodium picrate, it can be colored dark. Ordinarily, cementite in carbon steels is found, not by itself, but in combination with a certain amount of ferrite in crystals of what is known as *pearlite*. In slowly cooled carbon steels, the pearlite grains or crystals consist of an aggregate of thin parallel plates of ferrite and cementite alternately. When examined under low magnification, after etching with weak acids, the pearlite appears black against a background of light-colored ferrite, as shown in Fig. 2. At higher magnifications, as illustrated in Fig. 3, the structure is seen to consist of alternating plates of ferrite and cementite. The ferrite appears dark because in the polishing it wears down a little lower than the harder cementite, and therefore is in shadow in the photo.

As the carbon content of the steel is increased, the proportion of pearlite rises, from very small amounts in 0.10 per cent carbon steel, to some 36 per cent when the carbon content is 0.30 per cent. In steel containing 0.60 per cent, the ferrite usually appears as a white network around pearlite grains, and with further increase of carbon the network becomes discontinuous and the nets thin. Finally, at 0.80 per cent C, no ferrite is present, and the entire mass of the steel consists of pearlite.

In steels containing over 0.80 per cent C, cementite instead of ferrite appears as a network surrounding pearlite grains, and as thin plates distributed more or less at random through the pearlite. The higher the carbon, the greater the amount of this "free" cementite.

At 0.80 per cent C, steel is said to be of "eutectoid" composition, because the banded structure of the pearlite resembles that of the "eutectic" (lowest melting point) alloy of two metals. Steels containing less than 0.80 per cent C are called "hypoeutectoid," those with more than the eutectoid proportion are "hypereutectoid."

In carbon steel, ferrite or cementite and pearlite (or one of its numerous modifications) are the constituents existing at normal temperatures. X-ray spectrograms show that the atomic structure of the ferrite, which is iron in the alpha (α) condition, is body-centered cubic. Carbon is practically insoluble in alpha iron. When heated to a certain temperature, the ferrite changes from the alpha to the gamma (γ) state, in which the atoms are arranged in what is known as the face-centered cubic form. Gamma iron readily dissolves carbon, the solid solution being known as *austenite*. This constituent, however, is normally present only above a certain temperature, changing back to a mixture of alpha ferrite and pearlite when the steel is cooled slowly to atmospheric temperature again.

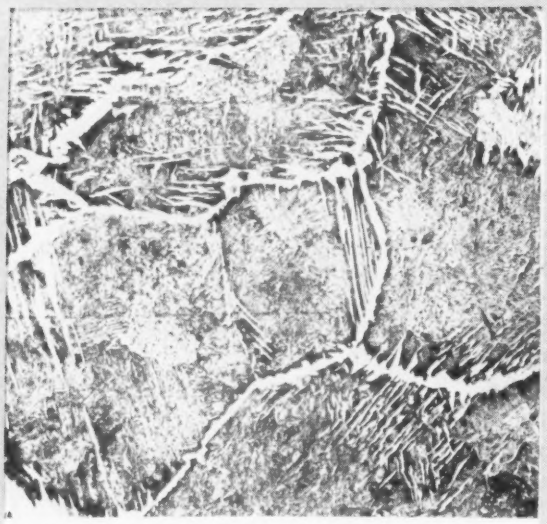


Fig. 5—As-cast structure of ferrite network outlining austenite grains at 40X

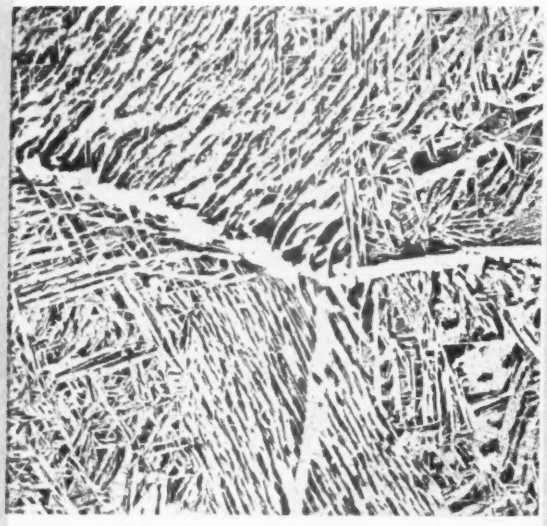


Fig. 6—Widmanstaetten structure with ferrite at austenite grain boundaries at 50X

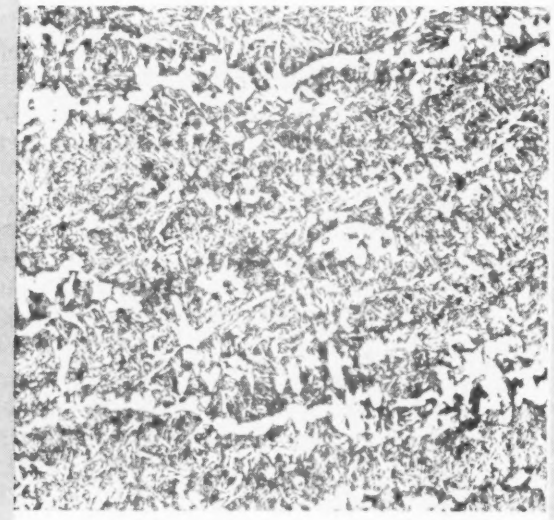


Fig. 7—As-cast structure of ferrite network showing the dendritic pattern at 80X

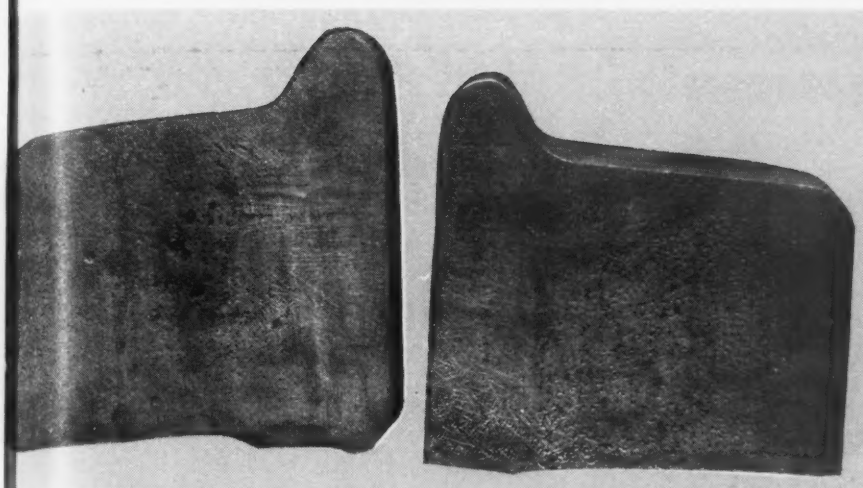
This and other changes in the internal structure of steel occur at definite temperatures, and metallurgists have worked out the familiar "iron-carbon diagram" (sometimes called the Roberts-Austen diagram, in honor of its creator), to show the ranges of composition and temperature within which the several constituents exist, under equilibrium conditions. Fig. 4 shows this diagram in its latest form, with carbon content plotted as abscissa and temperature as ordinate. For simplicity the lines showing the "delta" iron region are omitted. The steel foundryman is interested hardly at all in the portion of the diagram above 1 per cent C, and chiefly in steels containing less than 0.60 per cent C.

It must be remembered that the iron-carbon diagram represents the conditions that obtain when equilibrium has been established at any given temperature. The several lines thus show only what would occur at the temperatures they indicate, if the metal were held at that temperature long enough for the changes to proceed to completion. Under different conditions, such as accelerated cooling or heating, the temperatures at which the changes occur are markedly lower or higher and the structures produced are not the same. Other diagrams, to be described presently, summarize the effect of these altered conditions.

Lines Mark Temperature

The uppermost lines of the iron-carbon diagram, *AC* and *AE*, are known respectively as the liquidus and the solidus, and mark the temperatures at which solidification begins and ends, as molten steel cools. At temperatures above *AC* the steel is completely fluid. On cooling past the temperature represented by that line, solid gamma iron begins to form in the liquid, and increases in amount as the temperature falls from *AC* to *AE*. At the temperature indicated by the latter, the last of the metal freezes. The first particles to solidify are practically pure iron, so that the remanent unfrozen liquid becomes progressively richer in carbon and other metalloids as solidification proceeds. As a result, the last metal to solidify contains more carbon (and incidentally more phosphorus and remanent alloys) than the first-freezing particles.

It is in cooling through the temperature zone between *AC* and *AE* that the gamma iron dendrites described in the discussion of center-line shrinkage are produced.[1] Normally, the outer layers of the casting solidify quite rapidly and therefore form more or less equiaxed crystals. This is usually true also of the entire cross-section of thin pieces. In heavier sections, the rapid solidification of the outer portions is followed by slower freezing of the deeper-lying layers of metal. The solidification then proceeds by the growth of dendrites by accretion upon nuclei originally formed. The dendrites normally grow at right angles to an outer surface of the casting, and extend into the still-unfrozen mass of liquid metal. As they grow, branches shoot out laterally from their main stems, and still smaller branches from those, so that the dendrites assume the well-known "pine-tree" shape. Neighboring dendrites interlace their branches, trapping tiny lakelets of liquid metal, which crystallize upon the existing crystals, the very last particles



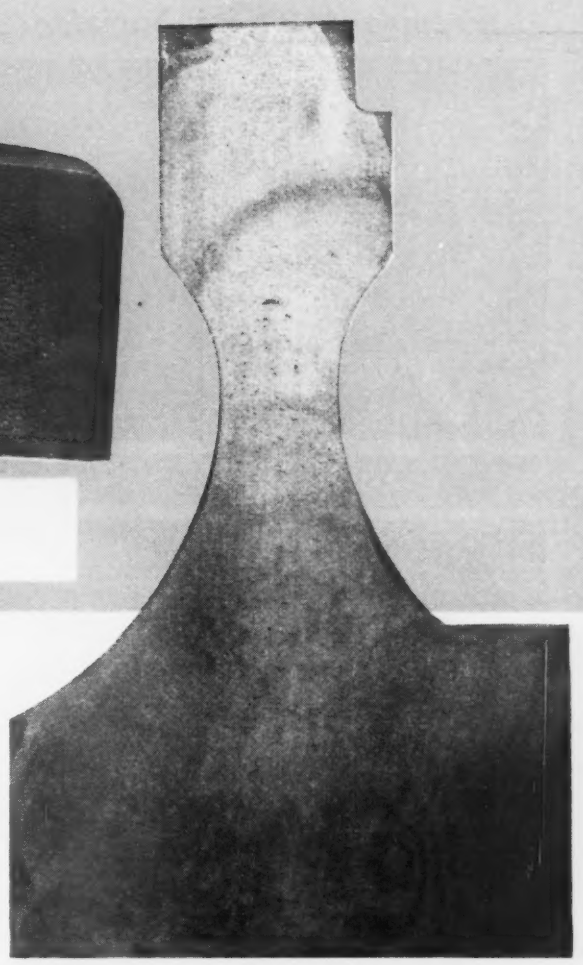


Fig. 8 (above)—Dendritic segregation in a heavy section
Fig. 9 (right)—Heavy casting that shows microshrinkage

finally freezing as their temperature reaches that of the line *AE*.

In moderately thick sections, dendrites reaching out from opposite walls trap the final unfrozen metal between their ends, and the freezing contraction of that material forms the "center-line shrinkage" cavities characteristic of uniform sections 1 or 2 inches in thickness. In very thick sections the dendritic zone usually extends only part way to the center of the piece, and equiaxed crystals form from the last metal to freeze.

As the steel cools through the zone between the line *AE* and *GSE*, the original dendritic crystallization is broken up and is succeeded by an aggregate of more or less equiaxed crystalline grains. (Actually, in most carbon cast steels, the first-frozen dendrites consist, not of gamma iron, but of another form known as delta iron. When the dendrites give way to the equiaxed crystals, delta iron changes to gamma. In higher carbon steels, and those containing a certain amount of alloy, gamma iron dendrites form directly from the molten steel. The point is of academic rather than practical interest.) These new crystals of gamma iron do not conform to the outlines of the original dendrites, but cut across them at random. Indeed, the dendrites as such no longer exist, and all that remains of them is the inhomogeneity of composition set up as they froze.

Heavy etching in boiling dilute acids, by differential attack upon the particles of slightly differing composition, reveals the existence, not of actual dendrites, but of their ghosts, as it were, in the form of dendritic segregation. Usually they are easily distinguished with the naked eye, and quite often are as much as 1½ or 2 inches in length. Fig. 8 shows a portion of a heavy casting in which dendritic segregation was pronounced.

As the actual dendrites are succeeded by another crystallization, which, as we shall see, is readily and usefully modified by suitable forms of heat treatment, it might be supposed that they have no influence on the mechanical and other properties of steel castings. Of and by themselves, in fact, there is good evidence to show that they do not.[2] Of late, however, it is being recognized that not the dendrites themselves, but the tiny spaces between their interlacing branches, affect quite markedly the properties of pieces of steel in which dendrites were formed during solidification.

The freezing contraction of the particles that form the main portion of the dendrites, serves only to diminish their volume, but that of the final particles to solidify, which while still liquid filled the spaces between the branches of the dendrites, creates minute voids in the metal. These cannot be filled up in any way, as can the major cavities in the last-frozen portions of a casting, since there is no possible source of molten metal to fill them. Though very small, and revealed only by deep etching, they are necessarily a source of weakness. Tensile test pieces cut from steel in which dendrites were formed during solidification, will usually show excellent mechanical properties so long as they do not contain any of these *microshrinkages*.

When they do, however, the discontinuity appears on the fractured face of the test piece, and if it is large enough, the percentage of elongation before fracture is reduced considerably. It is quite probable that these microshrinkages are one of the principal reasons why tests cut from full-sized sections of heavy steel castings often show much poorer elongation and reduction of area than those from keel-block coupons. The same would be true of (*Please turn to page* 264)

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Progress Marked by GRAY IRON FOUNDERS' SOCIETY

By DONALD H. WORKMAN
Executive Vice President
Gray Iron Founders' Society

TWENTY-FIVE years of association through the Gray Iron Founders' Society will be observed by gray iron foundrymen at the industry's 25th annual meeting in St. Louis on Oct. 8-9. Early arrivals will share in paying tribute to the 14 men who have served as president of this national organization when gold lapel emblems are presented at the President's Reception and Dinner on Oct. 7.

The gray iron industry has its roots in antiquity. Originally an ancient art, the foundry industry still provides an opportunity for real creative effort which generally has been lost in mass production industries. Historians still debate the date of cast iron's origin. Records indicate that long before the birth of Christ, the Chinese capitalized on early evolutionary developments and were the first successfully and regularly to produce iron castings in desired shapes.

Gray iron castings, at one time considered luxury items, rapidly found new and useful applications, such as for stoves, bells, houseware, implements and cannon. By the 19th century, thanks to the development of blast furnaces, cupolas and better fuels, gray iron was firmly entrenched as the leading metal in tonnage produced.

In the 16th century Sir Walter Raleigh discovered ore in the Carolinas, but the first casting was not produced in America until 1642, at Saugus Iron Works near Lynn, Mass. Soon other foundries sprang up in New England and the eastern coastal states, and the gray iron industry—the oldest capital goods industry in America—was well on its way.

Plowshares and cooking utensils, early American products, gave way to a myriad of products in a great variety of form. The industry's fascinating science, its adaptability to new situations and mechanical change and its unlimited usefulness have made it the second largest branch of the entire metalworking field today.

A Vast Industry—This vast American industry consists of about 2600 foundries, situated in every state except Wyoming. It provides job opportunities for approximately 275,000 workers and is capable of turning out about 20 million tons of castings per year. Current production is over 1 million tons per month, and annual sales exceed $2 billion.

Well over 100 consuming industries are dependent on gray iron products, and practically all of modern industry uses gray iron, at least as components of most production tools. Leading consumers are producers of motor vehicles and parts, tractors, machine tools, internal combustion engines, farm machinery, motors and generators, pumps and compressors, pressure and soil pipe, valves and fittings, railroads, construction and mining machinery, metalworking machinery and special industrial machinery. The gray iron industry accounts for more than 70 per cent of all cast metal products, producing about 400 pounds of castings for every ton of rolled steel consumed by American industry. The great steel industry itself is dependent on gray iron castings for ingot molds and rolling mill equipment.

During World War II, it was proved conclusively (*Please turn to page* 178)

Determination of Feeding Systems

By ROBERT A. CECH
National Malleable & Steel Castings Co.
Cicero, Ill.

DURING the past few years, improved experimental techniques and wider applications of heat transfer principles have resulted in a host of investigations on the subjects of solidification and proper feed systems. Granted that in most cases the experiments are only part of long-range programs, and the papers and published reports only interim reports, there are still many short-range benefits of practical use. It remains for the operating foundryman to follow closely the work in the laboratory and to carry on where experiments end.

This article describes a method which has been used with practical directional solidification theory to prescribe feeding systems for medium and large-sized steel castings. This procedure, which was adopted from the articles listed in the bibliograp was used with success to feed out many troubleso castings. In particular, gear blanks, turbine steam chest castings weighing up to 6000 pou (finished) were made sound with increased yield.

The method itself is not infallible, but it can a valuable tool if used correctly. The samples u to illustrate the procedure are necessarily simple do not limit the effectiveness of this method. W practice, it is not difficult to lay out the more c plicated shapes. The method uses data derived f tests where soundness was determined by X-ray s sitivity of 1.5 per cent, which is more than c mercially demanded.

PROCEDURE

In the layout of a casting for proper feeding, the steps to be followed are in general:

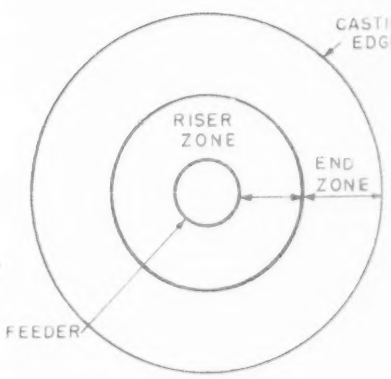
1. Assume one or more "feed-centers"—these are sections which, because of shape, size or location, cannot be fed through other sections and must be fed directly by feeders. (In the case of castings of constant cross section, such as rings or plates, this may be neglected and the feeders attached where convenient.)

2. Determine the approximate width-to-thickness ratio of the section chosen in (1). If a plate, use 5:1.

3. Choose the correct feeder size from Fig. 1 by finding the thickness of the section and moving vertically to the correct ratio, then horizontally to the left for the diameter. The feeder height is $1\frac{1}{2}$ times the diameter. Attach this feeder to the section of (1).

4. From Fig. 2, find the maximum sound riser zone, the zone surrounding the feeder.

5. From Fig. 3, find the maximum end zone. A sound end zone is found where the casting edge meets the sand. A sound end zone may also be created at the edge of an external chill located away from the edge of the casting.



6. Move away from the feed center chosen in (1), a distance

A method employed to determine feeder requirements of steel castings has proved successful in improving soundness and also yield

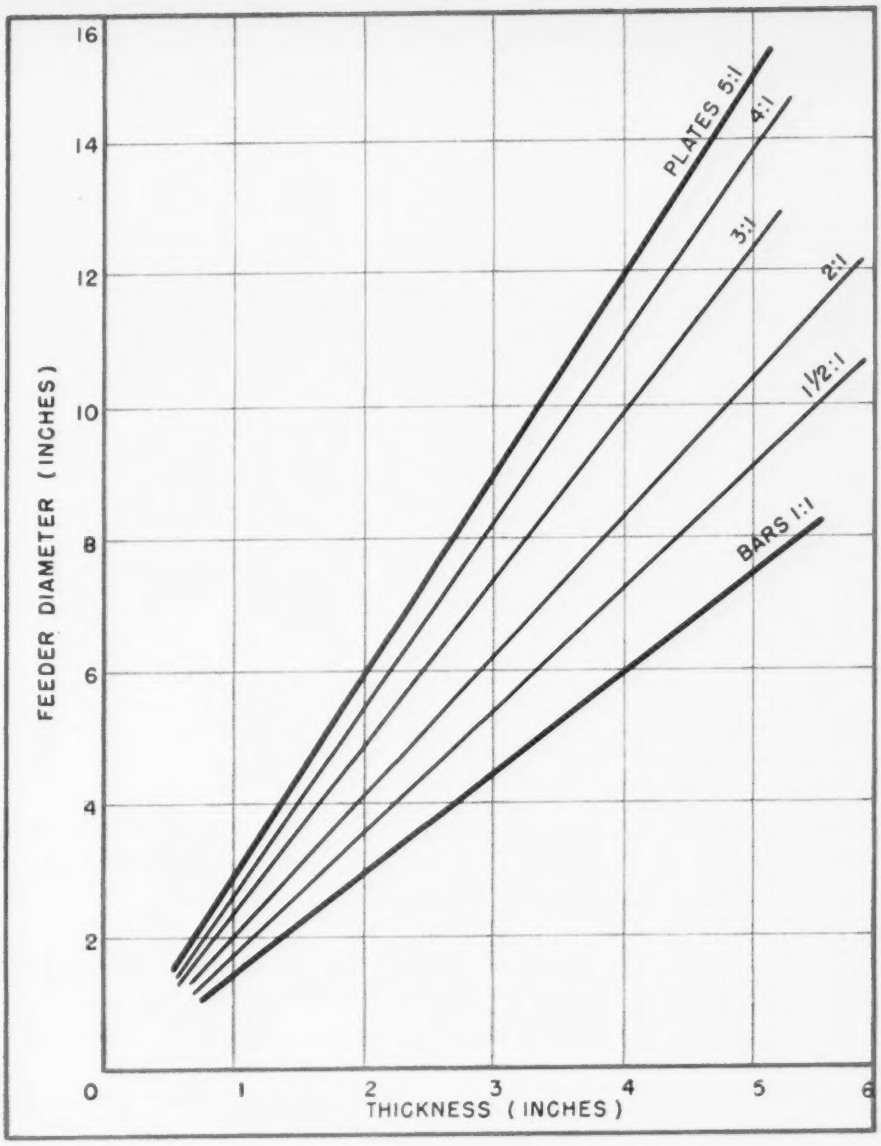
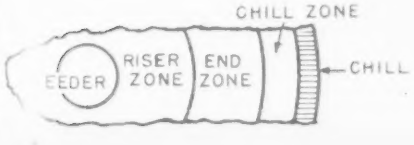


Fig. 1—Relationship of feeder diameter to section thickness for various width-thicknesses

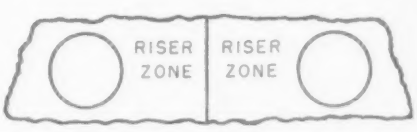
equal to the riser zone, measuring from the edge of the feeder in all directions. At this point, one of three alternatives may be chosen:

(a) Measure a distance equal to the sound end zone. If the edge of the casting occurs within the zone, the casting will be sound.

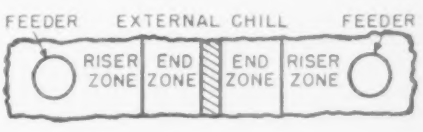
An additional length of sound casting equal to the casting thickness can be obtained by putting a chill at the end of the casting.



(b) If the casting is too large to be cast sound with one feeder, measure off another riser zone and place a second feeder. Then continue as in (a).



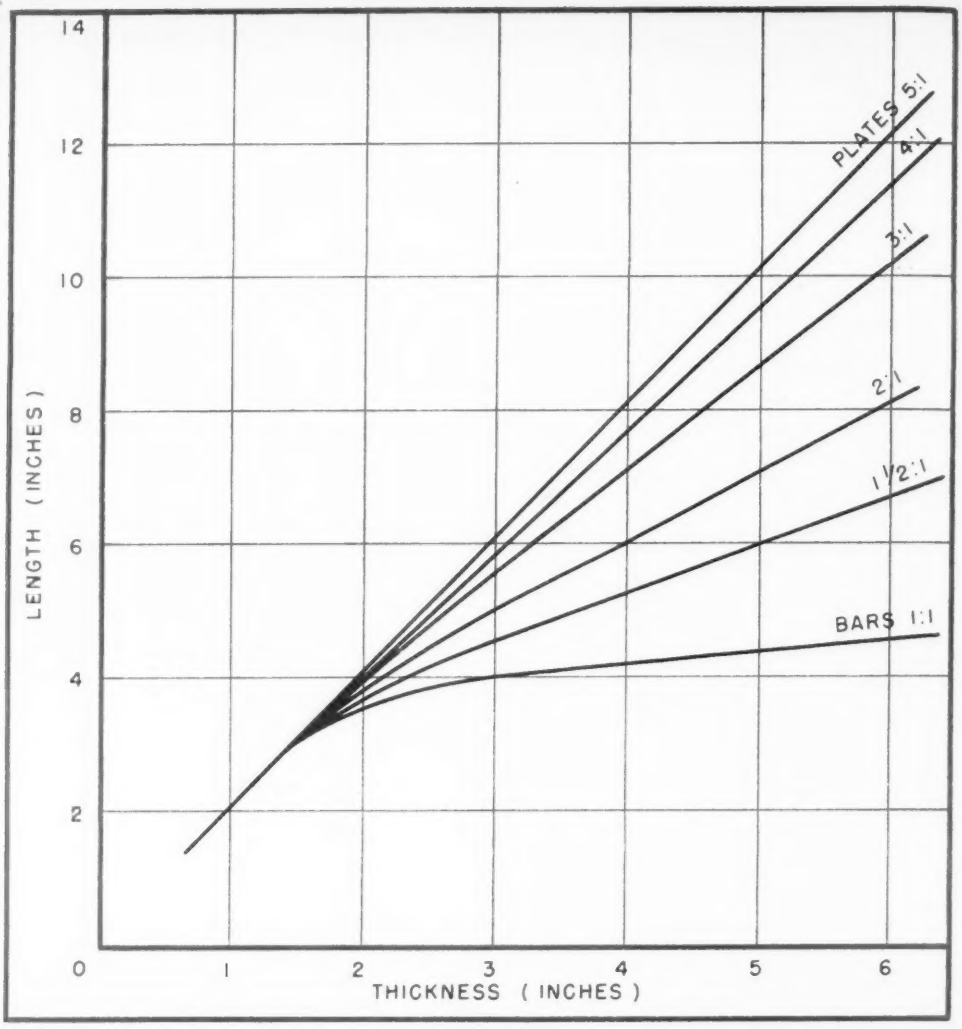
(c) If feasible, an external chill may be used to create an artificial sound end zone, thus extending the feeding range of the feeder and decreasing the number of feeders necessary. When this is possible, measure the sound riser zone as before, and add the sound end zone. Then place a chill at this point and measure off another end zone and riser zone.



Steps (b) and (c) can be continued until the edge of the casting is reached. Any chills used should be as heavy as the section they are chilling. Note: All distances should be measured from the edge of the feeder and the edge of the chill.

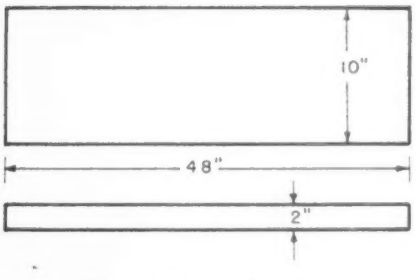
Fig. 2 (right) — Length of sound riser zone for various ratios of width-thickness

Fig. 3 (extreme right)—Length of a sound end zone for various ratios of width-thickness



EXAMPLES

A. Simple Plate



1. Since the casting has a constant thickness, there is no "feed-center" and the feeder can be placed where desired.

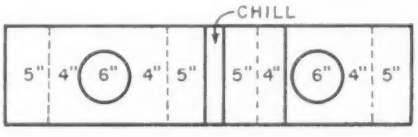
2. Width-to-thickness ratio is 5:1.

3. From Fig. 1, feeder diameter is 6 in.—minimum height of feeder is $1\frac{1}{2}$ x 6—9 in.

4. From Fig. 2, maximum riser zone is 4 in.

5. From Fig. 3, maximum end zone is 5 in.

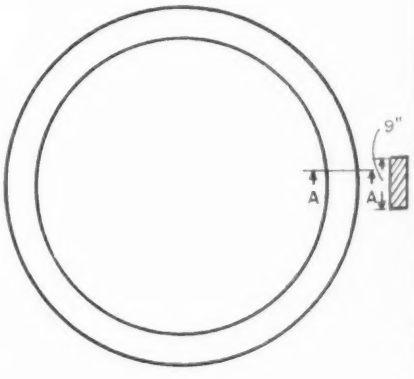
Start from the end of the casting and measure a distance equal to riser and end zone: 4 + 5 = 9. Place a feeder at this point and lay off a distance equal to riser and end zone total on the other side.



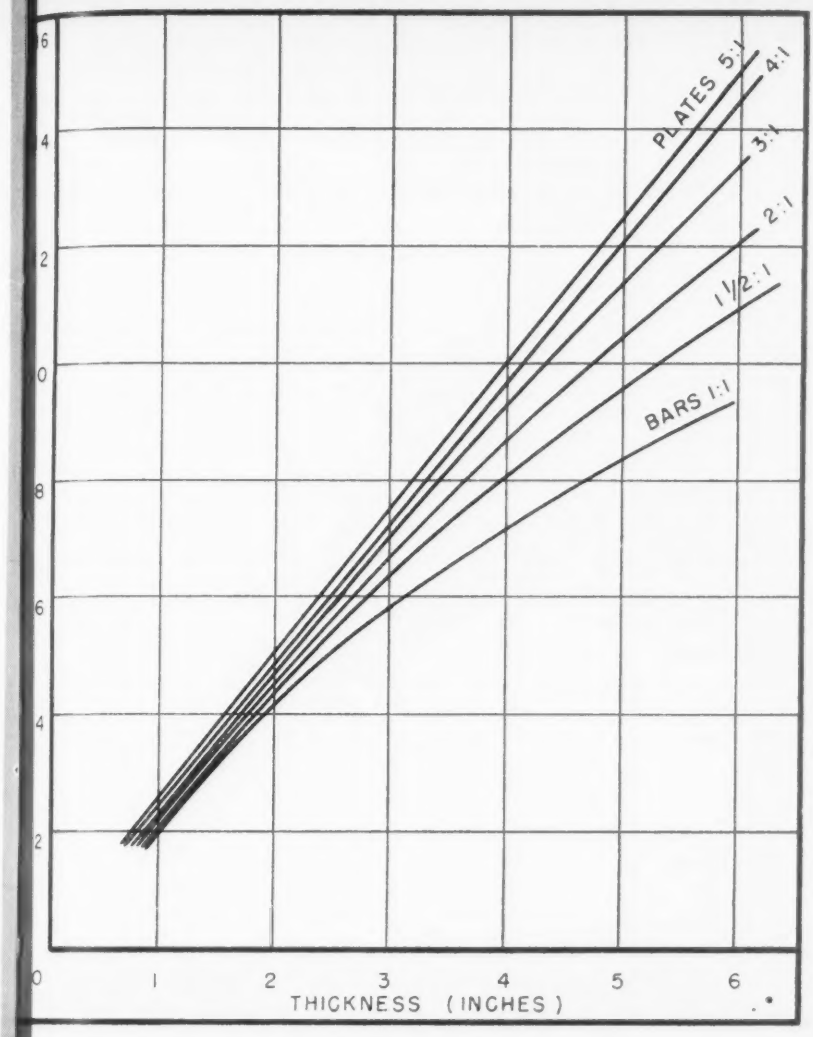
Then place a chill at this point. Since the chill sets up an artificial end zone, measure another 9 in. and place a second feeder.

B. Gear Blank

This casting is a simple ring shape since the teeth will be machined.



O.D. = 36 in. I.D. = 30 in. Mean diameter = 33 in. Mean cir-



cumference = 104 in. This is effectively a plate 3 × 9 in. which has been formed into a circle.

1. There is a constant cross section, so feeders may be placed where desired.

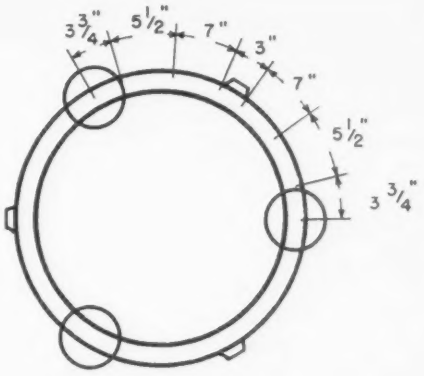
2. The width-to-thickness ratio is 3:1.

3. From Fig. 1, the feeder diameter is 7½ in.—minimum height is 1½ × 7½ = 11¼ in.

4. From Fig. 2, riser zone = 5½ in.

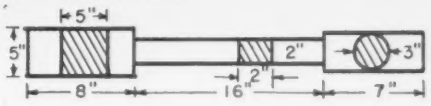
5. From Fig. 3, end zone = 7 in.

The longest casting can be made with feeders separated by a chill. In this case, attach a feeder at any point along the ring. Measure from the center of the feeder:



3¾ + 5½ + 7 + 3 + 7 + 5½ + 3¾ = 35½ in. Dividing this into the mean circumference (104 ÷ 35½) = 3 approx. Therefore, this ring can be made sound by using three feeders and three chills. If no chills were used, at least six feeders would be necessary.

C. Lever Arm



1. The block on the left and the cylinder on the right are both "feed-centers" since neither can be fed effectively through the center bar.

2. The left side has a width-to-thickness ratio of 1:1. From Fig. 1, this takes a feeder whose diameter is 7½ in. and a height of 7½ (1½) = 11¼ in. minimum. With a top feeder, this will be sound. (Riser zone = 4½ in.)

3. The right side can be figured as a 3 × 3 bar; width-to-thickness ratio 1:1. Feeder diameter is 4½ in. from Fig. 1. Using a top feeder, this will be sound. (Riser zone = 4 in.)

4. The block and cylinder act as feeders to the rectangular bar joining them. From Figs. 2 and 3, a 2 in. bar with a chill between the feeders will be sound. 3½ + 4 + 2 + 4 + 3½ = 17 in. Since the bar is 16 in. long between the block and cylinder, it will be sound.

This is not meant to be the whole answer to problems of feeding, but shows how experimental work can be adjusted to aid the practical foundryman.

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QUESTIONS

Sand must not clog nozzle ..... Cracking shortens life
Borings cause trouble ..... Form molds by plating
Hairline cracking ..... Hardness not uniform

Sandblast Sand Must Be Dry

QUESTION Why is sandblast sand heated? Does the heating process increase its efficiency in any manner?

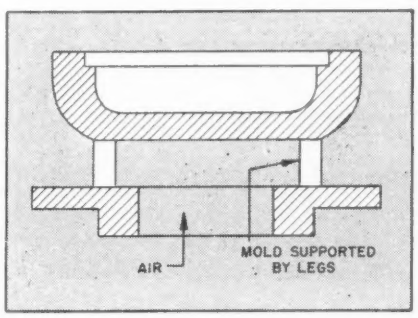
ANSWER Sand employed in sandblast operation in the foundry is heated simply for the purpose of removing any moisture that may be present. Moisture acts as a bond and prevents the sand from flowing freely. In the various forms of sandblast devices the sand is conveyed by air at pressures varying from 70 to 100 psi. Unless it is perfectly dry it will clog the passages. Even if the sand could be used while wet it would be objectionable on account of the rust it would create on the face of the casting.

Fire Cracks Cause Short Life

QUESTION We are having difficulty with cast iron molds for forming borosilicate glassware due to short life resulting from fire-cracking or heat checking. The casting, as shown in the accompanying illustration, is bowl shape, and we have tried various means of increasing the life. Metal thickness has ranged from ¾ to 3½ in. in the bottom section, and cooling ribs or radial grooves from ¼ to 1 in. deep have been machined into the bottom surface. Mold is supported on four legs, and an airblast on the mold bottom has been tried. Difficulty of course is due to the periodic heating and cooling cycle of the mold which ranges from 950 to 1250° F. Is there any technical data available which might aid in solving the problem?

ANSWER Glass molds, as you undoubtedly know, have to possess such a wide variety of properties—some of which are opposites—that a compromise must be effected to obtain the best over-all life. Properties involved include machinability, fine dense surface, resistance to growth and distortion, good resistance to heat, scaling and cracking at high temperature, ability to take a high polish, etc.

According to experimental work by Bruckner and Czyzewski in *Transactions* of the American Foundrymen's Society, 1942, resulting structure of the mold appears to have an important effect on its life, and best results were obtained with an alloy iron which was annealed to provide a matrix of free ferrite, partially spheroidized pearlite, and lamellar pearlite. The authors believe that the ferrite absorbed the thermal shock, and the lamellar pearlite provided strength to resist spread of cracks.



Cross-sectional view of a cast iron mold used for producing glassware

Alloy iron which, under the test conditions, gave the best results contained 2.40 per cent Si, 0.66 per cent Mn, 3.44 per cent TC, 1.25 per cent Ni, 0.45 per cent Cr, and 0.50 per cent Mo. Specimens were cast in the form of 6 x 9 x 2½ in. blocks with the 6 x 9 in. face cast against the chill. From these blocks 2-in.-diam and 2-in.-long specimens were turned. For annealing they were heated slowly to 1450° F, held for 4 hr, and furnace cooled.

Bruckner and Czyzewski found that sand-cast alloy irons gave better results than chill-cast materials, but the coarse graphite flakes resulted in an open, porous structure which did not take the polish required for glassware production. Indications also were that irons which produced a dendritic structure were less resistant to cracking—the more dendritic, the less resistant.

In the discussion it was pointed out that high-total-carbon irons were more resistant to thermal shock than low-carbon irons, that chill-cast irons invariably develop a dendritic structure, and that while high-carbon irons usually are not affected much by inoculation, that practice with such irons cast against a chill should be beneficial.

Tries Cupola Melting Borings

QUESTION In our foundry in India we have been trying to melt steel borings and turnings in the cupola. We placed the turnings and borings in our 45-in. ID cupola after our regular heat, using 560 lb metallics, 18 lb limestone, and 140 lb coke, but only melted at the rate of 2 tons per hr against the usual 7 tons per hr with regular iron charges. Also the slag from the spout was excessive and uncontrollable. Iron from the cupola is tapped into 28-lb capacity ladles, but after being carried 30 to 40 ft to be poured into pig molds it sticks so badly to the lining that after three or four turns the ladles are too heavy to use. When we try to remove that mateiral, the lining comes out too.

ANSWER Your troubles with trying to melt cast iron borings and steel turnings in the cupola are not unexpected, since the large surface area of those materials in relation to their volume results in such severe oxidation that the procedure seldom is practiced. Such oxidation is indicated by your remarks about the iron freezing or skulling in the ladle, and excessive, prob-

? ANSWERS

ably foamy, slag generated during melting. So far as we know no foundry in this country is trying to recover borings by straight melting in the cupola. Some occasionally will place a charge of borings on the last iron charge which then is cast into pigs.

We understand that one British foundry, according to the March 20, 1952 issue of *Foundry Trade Journal* (London), is recovering borings in a similar fashion—that is, at the end of the regular melting operation. However, a small charge of cast iron scrap is used and the borings then are added by the shovelful to prevent chilling. The blast at the time is reduced to one-third that regularly employed.

In the July, 1951 issue of FOUNDRY a device was described for recovering borings by injecting them into the cupola just above the melting zone. This is done in connection with the regular melting schedule.

Making Electroformed Molds

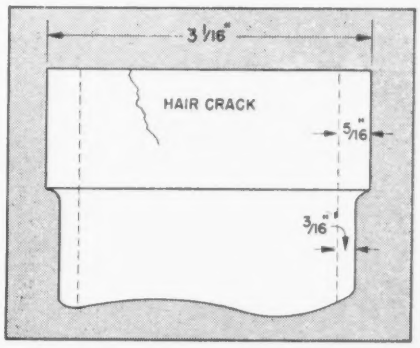
QUESTION Any information on the technique of making electroformed molds for slush casting plastisols will be appreciated.

ANSWER Procedure for electroforming usually involves a plaster or wax model or pattern. Plaster model is coated or impregnated with wax or some other material to withstand immersion in the plating solution. Pattern then is coated carefully with fine graphite on the areas which are to be reproduced. Pattern is made the cathode in a copper plating bath. Alternatively, the models or patterns are given two coats of shellac by dipping, and then sprayed with a thin lacquer containing metal powder—for example 1 fl oz nitrocellulose lacquer, 7 oz lacquer thinner and 2 oz bronze powder. After drying the piece is plated. Comparatively thin shells of copper formed by the process are backed up with other metals to form the working mold.

Tubular Castings Show Cracks

QUESTION We are sending you two cracked castings. In the past three weeks we have been having trouble with these which are portions of tubes, and also a gear cover casting. Analysis shows 1.87 per cent Si, 0.095 per cent S, 0.222 per cent P, 0.62 per cent Mn, 3.65 per cent Tc, 0.09 per cent Ni and 0.12 per cent Cu.

ANSWER Several possibilities exist which might cause the cracks in the tube sections sent for examination. One is that the cores may be too hard to permit yielding when the castings contract. Another is that in the specimens sent to us the cores are not centered; this results in unequal cooling rates between the sections of different thickness. A third possibility may be the composition of the iron.



Small hairline cracks appear in heavier section of tube casting

Some time ago an investigation by the British Cast Iron Research Association on cracking of light-section castings, particularly those with large area compared to volume, indicated that the carbon equivalent for such work should be about 4.6 or above, and where the C. E. was below that ladle inoculation aided appreciably in obviating the cracking. The C. E. of your present iron is 4.35 and presumably the composition is satisfactory for pouring a range of castings. Hence, we suggest trying ladle inoculation with 10 oz 80 per cent powdered ferrosilicon per 100 lb iron on those castings with which you are having difficulty.

Cracking of the gear case covers probably is due to the factor mentioned above although it may be due to rough handling or shaking out too soon; however, the previously mentioned investigation indicated that the latter seemed to have little effect.

Finds Variations in Hardness

QUESTION We would like some information in solving a problem we have encountered. A gray iron casting weighing about 70 lb with sections from 5/8 to 1 in. was found to contain hard spots. Composition showed 2.47 per cent Si, 0.45 per cent Mn, 0.083 per cent P, 0.121 per cent S, and 3.65 per cent TC. Adjacent areas on the casting had hardnesses of 220 and 380 Bhn. Metallographic examination showed both areas to contain type A graphite with a pearlitic matrix in the softer, and an acicular structure in the harder area. Casting is made in green sand mold with green sand core, dumped out at 1300 to 1450°F, and air cooled. There was no sign of sand trouble such as wet sand. Spectrographic qualitative analysis showed no concentration of residual elements in either section—less than 0.1 per cent in all cases. We realize the chemical analysis is not what is to be desired in this casting, but wonder if the low ratio of Mn to S might have been responsible for this condition. Just how does S affect hardenability? Could C and Si contents or their ratio have been a contributing factor?

ANSWER We do not believe the ratio of sulphur to manganese is the major factor in your problem of

hard spots. The design and gating are not given nor the location of the hard spots, and therefore, any diagnosis is highly hypothetical.

It takes very little difference in cooling rates or cooling gradients to produce different transformation products such as the pearlitic and acicular. Temperature of 1450° F is well above the starting point of those transformations. Going in the reverse direction (heating up) a quench from 1450° F can produce marked hardening and an acicular structure. Coming down in temperature (from 1450°) is worse. Hard edges are common under such conditions.

A normal expectancy would be much ferrite in the pearlite in a casting of this size and analysis, cooled to say well under 1300° F before shakeout. If the iron is oxidized in melting or if poured at quite low temperature, too slowly, with wet sand, or in presence of small amounts of such elements as chromium, or made with pig iron from a "slipping" furnace, peculiar things do happen. It is considered desirable to have the manganese content at least three times that of sulphur. In the present case 0.45 per cent Mn and 0.121 per cent S satisfies that condition. Very high S and low Mn are more likely to promote actual chill spots or mottle.

Depicts Fracture Appearance

QUESTION We have been asked by one of our customers to supply them with chilled iron grinding spheres in 2, 3, 4 and 5-in. diam. We never have made any of those and would like to know if the term "chilled" means that they are cast in a metal mold or chill. What would be the analysis? Could we predict the amount of wear? Are there foundries which make a specialty of producing that type of work?

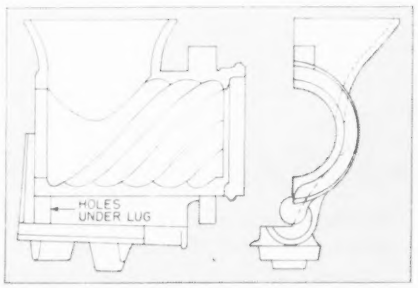
ANSWER Reference to "chilled" in connection with grinding balls primarily indicates the appearance of a fractured ball which is white rather than gray. Such a structure can be obtained either by selection of a suitable low-silicon composition, an alloy iron containing sufficient chromium or chromium and nickel to stabilize the carbide, or by pouring in a chill mold. In fact the three methods are employed in making grinding balls. Chill molds are preferred by some because the silicon content does not have to be as low as in the case of sand casting.

We believe in the case of chill-cast balls the silicon should not be over 0.60 per cent, and in sand-cast, not over 0.40 per cent. Experimental work would have to be conducted to determine the range of composition for the various sizes of balls involved. Method of sand molding is shown on page 172 in the May, 1952 issue of FOUNDRY. We doubt that you could predict any wear life of grinding balls without long and extensive field tests. A number of foundries specialize in making such balls.

Blow Holes Appear Under Lug

QUESTION We are making castings for a corn chopper and made a good many before it was discovered that blow holes were occurring under one of the lugs as indicated. Trouble has been corrected but, as mentioned, we have a considerable number of the castings on hand which we would like to salvage if possible. The castings are hot galvanized before use. Can you suggest any method to fill the holes without coming out in the galvanizing operation?

ANSWER The only method we can think of which will fill the holes and not come out when the castings are hot-galvanized is to use welding filler rod. However, the position of the holes behind the lug is such that it is extremely doubtful that a welder can reach them to perform a good operation since there is only about 3/16-in. space to work in.



Holes' position under small lug makes repair extremely difficult

Evidently the plugging of the holes is for appearance, since they do not appear to be located where they have to withstand stress. Possibly you could do the hot galvanizing operation with the holes present, and then plug them with one of the several aluminum-color filler materials in paste or powder form that are available on the market.

Has Trouble in Ramming Sand

QUESTION We make a great number of flat castings from 7 in. square up to 48 in. square, and from 1 to 3 in. thickness. These are presently made by hand ramming in flasks 6 in. deep and up to 5 ft x 6 ft on the side. Flasks also are very heavily barred—spacing being about 6 in. We would like to mechanize this operation and have tried sand slingers and plain jolt stripping machines. Slingers do not pack the sand dense enough under the bars and swells result in our flat plates. A jolt stripping machine, because of the shallow head of sand, does not pack the sand sufficiently to get good draws without frequent drops. Sand we use is weak and fine to produce a good finish, and we are hesitant to change it. Have you any suggestions?

ANSWER It seems rather odd to us that your molds cannot be rammed satisfactorily by a sand-slinger or jolt machine, and suggest that you get in touch with the manufacturers for aid in solving the problem. The fact that neither of the units mentioned packs or rams the sand sufficiently under the bars suggests that this particular feature be given some study.

While you mention the flasks are heavily barred, you do not indicate whether they are thick and extend down close to the pattern. If that is the case, it will be difficult to get proper ramming under them without tucking or peening along the bars. Thick bars should be tapered sharply so that only a thin edge is located above the pattern. With that arrangement the sand can be driven under the bars by slinging or jolting without difficulty.

Another procedure would be to remove every other bar on one set of flasks for experimental purposes. We believe that flasks will be rigid enough with 12-in. spacing, but if not you could cast replacement bars and bolt them into place. You

(*Concluded on page* 136)

Need small tonnages of prepared sand?

These ROYER SAND CONDITIONERS handle from 4 to 15 tons per hour

The need for sand preparation equipment in small to medium sized foundries is just as great as it is in large production shops —but the machine must be designed for the job. And that *is* the case with Royer Sand Separators and Blenders. The models illustrated (the Junior, NB-2 and NC-4) are made for foundries needing a comparatively small tonnage of prepared sand . . . but definitely needing it.

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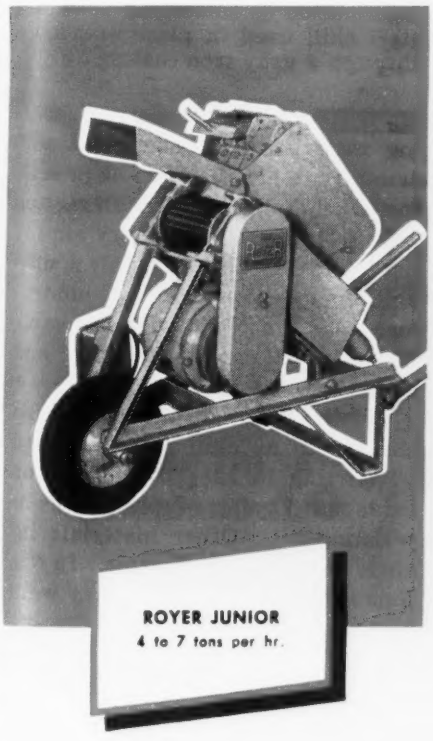
You profit many ways with a Royer. Write for information on the model best suited to your needs. Complete details will be sent on request.



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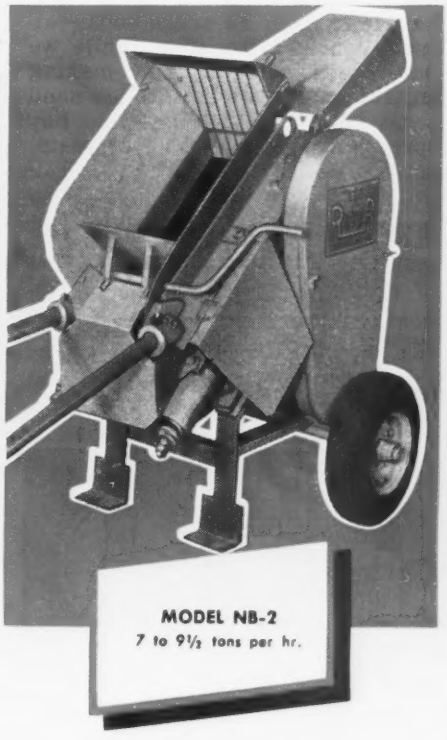
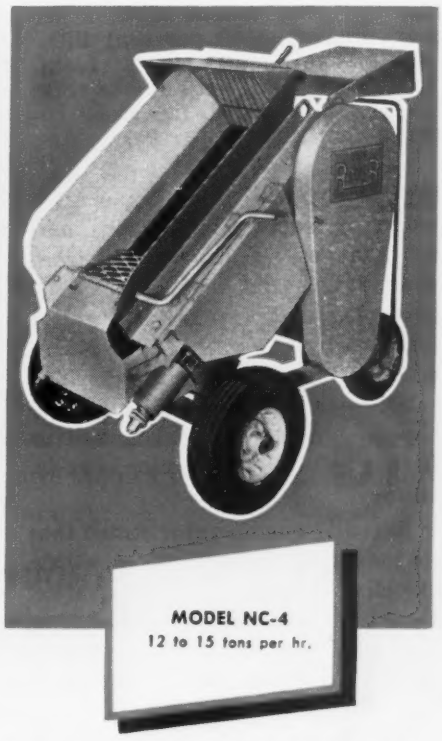
4 to 7 tons per hr.



MODEL NB-2
7 to 9½ tons per hr.



MODEL NC-4
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(*Concluded from page* 134)

mention that one trouble with jolting is the shallow head of sand. That can be overcome easily by using an "upset" or frame of any desired height on the flask to provide additional sand which is struck off after jolting.

Last, but not least, it probably would be well worth while to study your sand conditions and determine whether it is necessary to use a "weak" sand. Why not use a fine sand for facing which is backed up by a stronger open sand?

Color Judged from Exterior

QUESTION We recently have been studying the significance of slag color as the controlling factor in cupola operation and understand that the correct melting conditions inside the cupola exist when the slag is dark olive green. However, none of the references we have consulted states specifically whether the color is for surface or a fresh, clean fracture. We have been obtaining a green tinge on the exterior of our slag samples but when broken the interior is jet black. Chemical analysis shows 5 per cent Fe_2O_3, 20 per cent Al_2O_3, 12 per cent CaO, 9 per cent MgO, 2 per cent MnO_2, and 49 per cent SiO_2. Cupolas are lined to 54 in. Metal charge is 2000 lb with a coke ratio of 9 to 1 and 60 lb limestone between charges.

ANSWER Color of cupola slag is judged by surface appearance, and not that of the fracture. From your description of the color of your slag and the analysis given, you appear to be operating in a safe range. Not too much has been done relative to slag conditions in the cupola, but the general consensus is that an olive green color is satisfactory.

Recently one operator stated that as long as his slags stayed within the olive green to gray-black range, conditions were satisfactory. When the slag turns black, it is a good indication that oxidizing conditions are occurring—provided that the scrap is not rustier than usual.

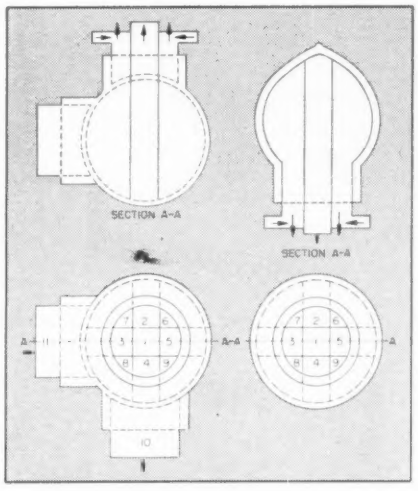
Actually not a great deal of study has been made of cupola slags, and there appears little agreement on what constitutes a suitable analysis. Bolton in his book *Gray Cast Iron* indicates that the usual range for good practice shows 35-45 per cent silica, 5-25 per cent alumina, 5-8 per cent iron oxide, 1-4 per cent manganese oxide, 30-40 per cent lime and magnesia, and over 0.5 per cent sulphur.

The *Handbook of Cupola Operation* (American Foundrymen's Society) states—"In average cupola practice when melting gray iron mixes with a coke-iron ratio of 1 to 10 and using 48 lb of limestone per ton of metal charge, the slag should analyze approximately 37 per cent bases, 44 per cent silica and 19 per cent iron oxide and alumina. Such a slag would be acid in about the ratio 1 to 1.20. With normal alumina content of between 11 to 13 per cent the slag will have a softening point between 2300 and 2400° F. Such a slag normally will absorb and hold a maximum of 0.5 per cent sulphur and therefore is not classed as a true desulphurizing slag."

Need Sectional Core for Draw

QUESTION We operate a small aluminum foundry, and for some time have been interested in permanent molds. Our work mainly is fence hardware such as acorn tops, rail ends, center rails, etc. While we have been successful in making suitable molds, we have to use sand cores since we have not had any success with permanent or metal cores.

ANSWER Metal cores are used successfully in producing many types of hollow castings by the permanent mold process. However, it often happens that the shape of the interior is such that the core must be made in so many pieces or sections to permit drawing that it is far simpler to use a sand core. In the case of the comparatively small castings you are making we believe that you are much further ahead by using sand cores than you would be in trying to use metal cores.



Sketches indicate the numerous sections required for withdrawal

As indicated in the accompanying sketches showing a three-way corner casting and an acorn post-top casting, you will note the multiplicity of sections required to allow the core to be removed from the casting. Each of the sections has to be of such size that it can be pulled through the opening after the center section (1) is removed to permit space for horizontal movement of the surrounding pieces.

Metal cores for work of this kind usually are made of alloy tool steel possessing heat resistance. Operations involved in withdrawing and reinsertion in the mold would require time. So all in all, the costs likely would be much higher than the casting warrants.

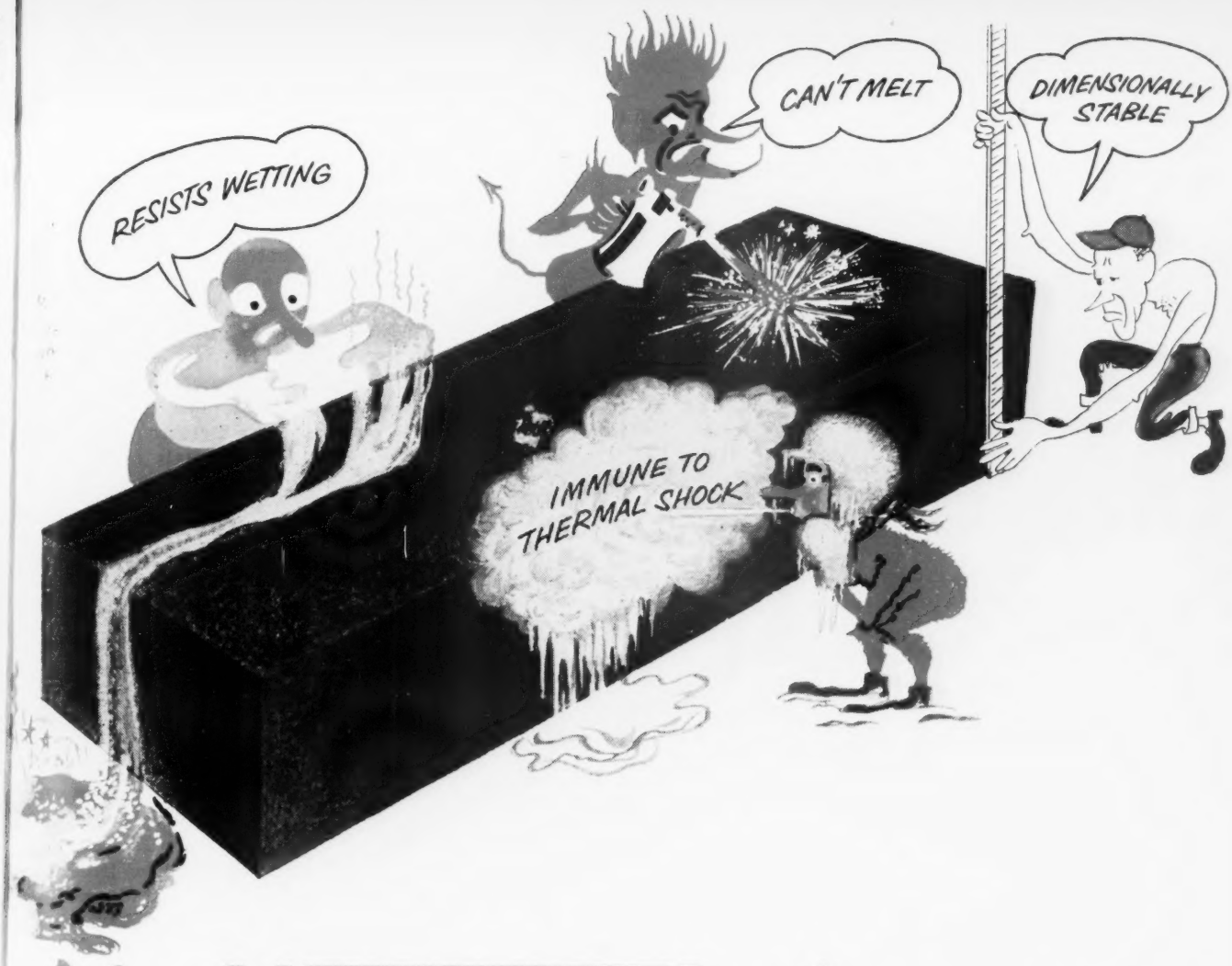
Steel Chill Coating Material

QUESTION Could you give us information on something to coat a steel chill used in place of a core through a gray iron casting?

ANSWER A wide variety of coating materials are being used successfully to prevent burn-on or seizing of chills in contact with molten gray iron, and any foundry supply firm should be able to supply a suitable composition. Some foundrymen coat the chills with the same blacking as used for molds and cores.

Carwheel makers coat the tread chills with a "chill paste" formed by stirring in 12½ lb of red iron oxide into 1 gallon of a special heat-resisting oil. Other materials include graphite and red talc. In one foundry the cylindrical chills were given a light coating of core oil, then rolled in fine silica sand or flour, and baked.

Still another foundry, instead of using gray iron or steel chills to form the hole in a casting, employed Ni-Resist, an alloy cast iron containing 14 per cent Cu, 7 per cent Ni, 2 per cent Cr, as it expanded when the molten iron was poured around it, and after the casting cooled it was easily removed.



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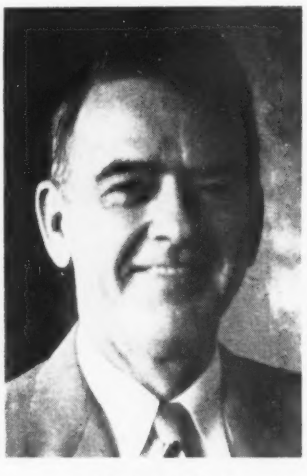
Men of Industry

DR. HARRY A. SCHWARTZ, for many years manager of research, National Malleable & Steel Castings Co., Cleveland, has retired from full-time work but his services will be available to the company as assistant to the vice president in charge of production. **B. C. Yearley,** since 1946 assistant manager of the company's Chicago works, has been transferred to Cleveland as director of applied research, process control and supervisory training. Dr. Schwartz holds honorary degrees from Rose Polytechnic Institute, where he was graduated in 1901, and from Case Institute of Technology. He joined the company in 1902 and established the first complete research department in the foundry industry in 1912. For his technical and scientific contributions to the foundry industry, Dr. Schwartz was awarded the John A. Penton Gold Medal of the American Foundrymen's Society in 1931, the E. J. Fox Gold Medal of the Institute of British Foundrymen in 1939, and the McCrea Medal of the Malleable Founders' Society in 1951. For many years he has been a member of FOUNDRY's advisory staff. Mr. Yearley was graduated from Case Institute and joined National Malleable in 1924. He was transferred from Cleveland to Chicago Works in 1926 and during World War II was foundry superintendent for its malleable and steel foundries. He became superintendent of the plant in 1943.

DR. HARRY A. SCHWARTZ
. . . retires from research

WILLIAM E. MAHIN
. . . becomes technical director

B. C. YEARLEY
. . . National Malleable research



FRED B. RIGGAN
. . . becomes foundry consultant

♦ ♦ ♦

William E. Mahin, since 1949 director of research, Armour Research Foundation, Chicago, has been named technical director, Vanadium Corp. of America, New York. Mr. Mahin was graduated from Notre Dame University and received a master's degree in metallurgical engineering from Carnegie Institute of Technology in 1933. He was associated with Westinghouse Electric Corp., East Pittsburgh, Pa. until 1946, when he joined Armour Research Foundation as chairman of metals research. Mr. Mahin served as Chicago Chairman of the ASM and AIME and as a member of various technical committees of AFS.

♦ ♦ ♦

Fred B. Riggan, for the last three years vice president in charge of research and development, Key Co., East St. Louis, Ill., has resigned to establish a foundry consulting service. Mr. Riggan attended Birmingham-Southern College and was associated with National Cast Iron Pipe Co., Tarrant, Ala., and Stockham Valve & Fittings Inc., Birmingham, until 1938 when he joined Key Co. to organize its metallurgical department in a new foundry. He became successively superintendent, plant manager and works manager, prior to being made vice president. Mr. Riggan is the author of many technical articles and papers.

♦ ♦ ♦

W. W. Harris, since 1948 superintendent of the Cleveland Works permanent mold plant, Aluminum Co. of America, has become its manager, succeeding the late T. Brian Parsons. Mr. Harris joined the company following graduation from Pennsylvania State College in 1937. **M. E. Gantz,** a graduate of Colorado School of Mines who joined the company in 1940, has become assistant manager of the permanent mold plant. **W. G. Turner,** since 1949 chief industrial engineer of the forge plant and a graduate of University of Minnesota, has succeded Mr. Gantz as manager of the magnesium permanent mold plant. He joined Alcoa in 1941.

♦ ♦ ♦

Charles W. Kapplinger, formerly metallurgical and research engineer, American Ski Co., Clare, Mich., has joined the Carboloy Department, General Electric Co., as an engineer in the metallurgical process and quality control unit for permanent magnet materials in Edmore, Mich.

(Continued on page 140)

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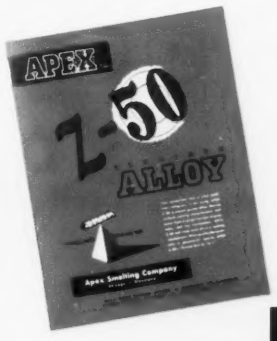

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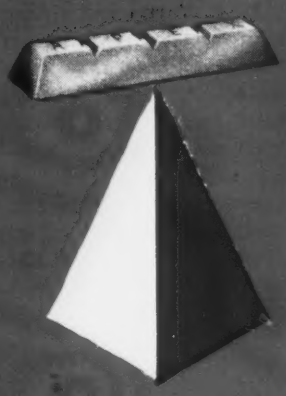

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. . . resident mgr., Eaton Mfg.

HOWARD R. JOHNSON
. . . Eaton factory manager

S. DAVID TYLER
. . . Eaton assistant gen. mgr.

(*Continued from page* 138)

Mr. Kapplinger was graduated from Michigan College of Mining and Technology.

♦ ♦ ♦

Richard E. Hoierman, formerly assistant to director of advertising, Cooper-Bessemer Corp., Mount Vernon, O., has been named advertising manager, Machinery Division, Dravo Corp., and the Dravo-Doyle Co., subsidiary, Pittsburgh, succeeding **Robert C. Black** who has been transferred to the sales staff of the division's heating department.

♦ ♦ ♦

E. J. Vargo has returned to Wellman Bronze & Aluminum Co., Cleveland, as assistant production manager. Mr. Vargo, a graduate of Case Institute of Technology, joined Wellman 11 years ago and served as metallurgist and plant superintendent. For the past year he has been works manager, Ebaloy Foundries, Rockford, Ill. Previously he was associated with Lukens Steel Co., Coatesville, Pa., and Timken Roller Bearing Co., Canton, O.

S. David Tyler, since 1952 factory manager, Foundry Division, Eaton Mfg. Co., Vassar, Mich., has been named assistant general manager. He joined the division in 1934. **Paul W. Olson,** who has been assistant to the resident manager, has been named resident manager. He has been with the division since 1946. **Howard R. Johnson,** formerly assistant factory manager, has become factory manager. He was appointed plant engineer of the division in 1946. **Ralph F. Evert,** production manager, has been appointed assistant sales manager. He joined the methods department in 1946.

♦ ♦ ♦

Don Gjesdahl, until recently sales manager, Seidelhuber Steel Rolling Mill Corp., Seattle, has joined Precision Castparts Corp., Portland, Oreg., as representative in Washington, Idaho, Montana and British Columbia, with headquarters in Seattle.

♦ ♦ ♦

Ray Kensel has been named sales manager for the Detroit, Cleveland, Cincinnati and Indianapolis area, Cleco Air Tool Division, Reed Roller Bit Co., Houston, Tex., succeeding **B. O. Stoothoff,** who has resigned. Mr. Kensel, formerly Cleco representative in Fort Worth, Tex., will make his headquarters in Detroit.

♦ ♦ ♦

Arnold L. Robertson and **J. A. Terpenning** have been named sales representatives for Thor foundry products of the Chemical Division, Borden Co., New York. Mr. Robertson, who has had 16 years of coreroom experience, has been assigned to the Ohio district, and Mr. Terpenning, formerly in charge of shell molding work at the division's Bainbridge, N. Y., laboratories, will handle the New York-northern Pennsylvania area.

♦ ♦ ♦

Stephen E. Kelly, elected president of the Northeastern Ohio Chapter of the American Foundrymen's Society for 1953-54, is assistant general manager, Eberhard Mfg. Co., Division of Eastern Malleable Iron Co., Cleveland. After graduating from St. Louis University in 1928, he spent a

(*Continued on page* 142)

E. J. VARGO
. . . returns to Wellman Bronze

DON GJESDAHL
. . . joins Precision Castparts

RAY KENSEL
. . . Cleco Air Tool sales mgr.

STEPHEN E. KELLY
. . . NEO Chapter president

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(*Continued from page* 140)

year and a half in chemical engineering studies at Washington University. Mr. Kelly was associated with Standard Oil Co. of Indiana, W. W. Cox & Co. and Southern Malleable Iron Co., St. Louis, from 1930-1939, when he became works manager and later co-manager, Arcade Malleable Iron Co., Worcester, Mass. He joined Eberhard Mfg. Co. 8 years ago. Last year he served as vice president of the Northeastern Ohio Chapter.

♦ ♦ ♦

William J. White was recently elected vice president-general manager, Shallway Corp., Connellsville, Pa., maker of shell molding machines.

handle the company's line of physical testing equipment in northeastern Ohio.

♦ ♦ ♦

S. J. Sindeband has been elected president, Mercast Corp., New York. Mr. Sindeband is also president, Alloy Precision Castings Co., Cleveland.

♦ ♦ ♦

Edward G. Bartelmas, for 8 years general foreman in charge of aluminum, Waukesha Foundry Co., Waukesha, Wis., has been named foundry superintendent, McKinley Metals, Fort Worth, Tex. Mr. Bartelmas, who joined Waukesha Foundry 16 years ago, has had extensive experience in brass, nickel, aluminum and permanent molding.

ceeded Mr. Akers as president. **Maynard B. Terry,** president of the American Brakeblok Division of the company, has become vice president of Dominion Brake Shoe Co.

♦ ♦ ♦

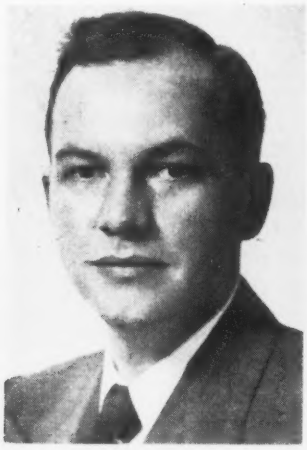
Dr. Robert F. Mehl, director of the metals research laboratories and professor of metallurgy, Carnegie Institute of Technology, will receive the Francis J. Clamer Medal of the Franklin Institute, Philadelphia, on Oct. 21. The institute will honor Dr. Mehl for his contributions in the fields of applied metallurgy and metallography.

♦ ♦ ♦

Joseph M. Halloran has been appointed sales representative in the New England territory, Ajax Engi-

C. E. McQUISTON
. . . *joins Advance Foundry*

EDWARD G. BARTELMAS
. . . *McKinley Metals supt.*



C. W. GILCHRIST
. . . *AFS chapter chairman*

JOSEPH M. HALLORAN
. . . *Ajax Engineering sales*

C. E. McQuiston, since 1950 foundry instructor, Industrial Engineering Department, Ohio State University, has joined Advance Foundry Co., Dayton, O., as foundry engineer. Mr. McQuiston was graduated from Purdue University in 1945 and received a master's degree in industrial engineering in 1950 from Ohio State University. He was previously associated with Hamilton Standard Propellers, East Hartford, Conn., and Wright Patterson Air Force Base, Dayton, O., in engineering capacities.

♦ ♦ ♦

David H. Paul, field engineer in the Philadelphia district, Norton Co., Worcester, Mass., has been made abrasive engineer in Maryland and Delaware, succeeding **Whitfield J. Bell** who has retired following 38 years with the company.

♦ ♦ ♦

George W. Grossman Jr. has joined Steel City Testing Machines Inc., Detroit, with headquarters in Cleveland. Mr. Grossman, a graduate of Case Institute of Technology, will

C. W. Gilchrist, chairman of Central Ohio Chapter of the American Foundrymen's Society for 1953-54, is foundry superintendent, Cooper-Bessemer Corp., Mount Vernon, O. Mr. Gilchrist joined the company's Grove City, Pa., plant as chemist and assistant metallurgist following graduation from Tri-State College in 1939. The following year he went to the Mount Vernon plant as assistant cupola operator, with responsibilities for sand and quality control. Following World War II service he returned to Mount Vernon as foundry engineer, became assistant foundry superintendent in 1948 and foundry superintendent in 1949. Mr. Gilchrist was vice chairman of Central Ohio Chapter last year.

♦ ♦ ♦

Thomas E. Akers, since 1951 president, Dominion Brake Shoe Co., St. Thomas, Ont., has become chairman of the board, succeeding **Maurice N. Trainer,** who continues as president of the parent company, American Brake Shoe Co., New York. **Kenneth T. Fawcett,** formerly vice president of Dominion Brake Shoe, has succeeding Corp., Trenton, N. J., where he will handle the company's line of induction furnaces.

♦ ♦ ♦

Dean M. Cochran has been appointed assistant sales manager, Hydraulic Press Mfg. Co., Mount Gilead, O., and manager of its metalworking and process press sales division. Mr. Cochran, a graduate of Purdue University, has been handling sales engineering and administrative duties for the company since 1952. Previous connections include Bryant Machinery & Engineering Co., Chicago, and American Steel Foundries at Cincinnati.

♦ ♦ ♦

Fred Eaton, until recently manager of the Casting Division, Bohn Aluminum & Brass Corp., Detroit, has been named vice president in charge of the Aluminum Division, Howard Foundry Co., Chicago.

♦ ♦ ♦

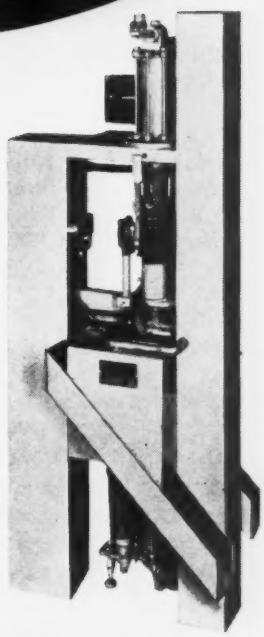
Harold G. Vaughn has been named president Muskegon Piston Ring Co., Muskegon, Mich., succeeding **T. E.**

(*Concluded on page* 144)

Save MAN HOURS and CASTINGS

BONDADDER

MOIST-RECORDER



SAND CONTROLLER

With DIETERT-DETROIT AUTOMATIC SAND PROGRAM

1. AUTOMATIC SAND TEMPERING

a. *WATERTELLER* automatically adds correct base water or slurry to sand mill to temper sand within 0.1% of chosen moisture content.

b. *WATERTEMP* adds necessary evaporation water.

2. AUTOMATIC SAND SYSTEM OPERATION

a. *AUTOMULL* times and cycles sand mill operations.

b. *BONDADDER* automatically adds sand additives.

c. *HOPPERTROL* operates plows and conveyors to keep sand bins and hoppers full.

3. AUTOMATIC SAND TESTING

a. *MOIST-RECORDER* determines and records exact moisture percentage of prepared sand.

b. *SAND CONTROLLER* tests and records the green properties of the prepared sand.

AUTOMATIC SAND TEMPERING

Write for LITERATURE

Engineers available to make survey

CONTROL EQUIPMENT
SAND · MOLD · MOISTURE
CARBON · SULFUR

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JOHN J. STOBIE JR.
. . . *Apex Smelting sales*

ALEX PIRRIE
. . . *heads Ontario Chapter*

GEORGE JOHN
. . . *Textile Machine metallurgy*

F. B. O'MARA
. . . *National Carbon sales mgr.*

(*Concluded from page* 142)

McFall who will continue as chairman of the board. Mr. Vaughan, who joined the company in 1927, has been first vice president since 1936.

♦ ♦ ♦

John J. Stobie Jr., formerly sales engineering the Chicago home office of Apex Smelting Co., has been transferred to Los Angeles. A graduate of University of Wisconsin, he joined the company in 1945.

♦ ♦ ♦

Edward M. Pinsof has been elected executive vice president, Sipi Metals Corp., Chicago, smelters and refiners of nonferrous metals. Other officers recently elected include: **Maury E. Lippert,** vice president-sales; **Joseph Levin,** vice president - production; **Joseph P. Antonow,** vice president; and **J. D. Rosenblum,** assistant secretary.

♦ ♦ ♦

William F. McIntosh has been appointed assistant sales manager of Durite products, Chemical Division, Borden Co., New York. Mr. McIntosh, who has been with the Durite organization for 18 years, has worked in the sales, research and development, and production departments and in the control laboratory.

♦ ♦ ♦

Donald S. McCleary has been named district purchasing agent, Continental Foundry & Machine Co., Coraopolis, Pa., succeeding the late E. M. McNally.

♦ ♦ ♦

Eugene J. Lenar has joined the Carboloy Dept., General Electric Co., Detroit, as an engineer in the metallurgical process and quality control unit for permanent magnet materials at the Edmore, Mich., plant. Mr. Lenar, a graduate of Michigan State College, was formerly associated with Western Michigan Steel Foundry, Muskegon, Mich.

Alex Pirrie, who has been elected chairman of the Ontario Chapter of the American Foundrymen's Society, is manager of Gurney Dominion Furnaces Ltd., and manager of Standard Sanitary & Dominion Radiator, Ltd., Toronto, Ont., subsidiaries of American Radiator & Standard Sanitary Corp., Pittsburgh. Mr. Pirrie served his apprenticeship as wood patternmaker and draftsman in Canadian National Railways, Montreal. He was associated with Warden-King Ltd. and Crane Ltd., Montreal, from 1929-1937, when he joined Gurney Foundry Co., Montreal, successively serving as pattern shop, foundry and machine shop foreman and later assistant plant superintendent. During World War II he was transferred to Three Rivers, Quebec, where he became plant manager of Electric Steels Ltd., and in 1945 went to Gurney Foundry Co. in Toronto, as plant manager of the heating division. When the plant was acquired by Standard Sanitary in 1950 he was made manager of the Gurney plant and of the Dominion Radiator plant.

♦ ♦ ♦

Raymond P. Wiggers, formerly advertising manager, Frank G. Hough Co., Libertyville, Ill., has joined Glenn-Jordan-Stoetzel Inc., Chicago, as vice president-account executive.

♦ ♦ ♦

Patrick H. Norton has joined the sales engineering staff, Frederic B. Stevens Inc., Detroit, as representative in the western Michigan territory, with headquarters in Grand Rapids.

♦ ♦ ♦

William S. Richmond, formerly associated with J. I. Case Co., Bettendorf, Iowa, has been named junior foundry engineer, Pacific Cast Iron Pipe & Fitting Co., South Gate, Calif.

George John has been appointed metallurgist, Textile Machine Works, Foundry Division, Reading, Pa., succeeding the late Werner Finster. Mr. John was associated with Ford Motor Co., Dearborn, Mich., prior to entering military service in 1942. He joined Textile Machine Works in 1946 as an apprentice machinist and in 1950 received one of the company's annual scholarship awards. He was graduated from Lehigh University in June, 1953.

♦ ♦ ♦

F. B. O'Mara has been appointed manager of metallurgical carbon sales, National Carbon Co., division of Union Carbide & Carbon Corp., New York. Mr. O'Mara joined the company in 1936 following graduation from Purdue University and spent several years at various company plants, studying the manufacture of carbon and graphite. Later he held administrative positions in the industrial sales department.

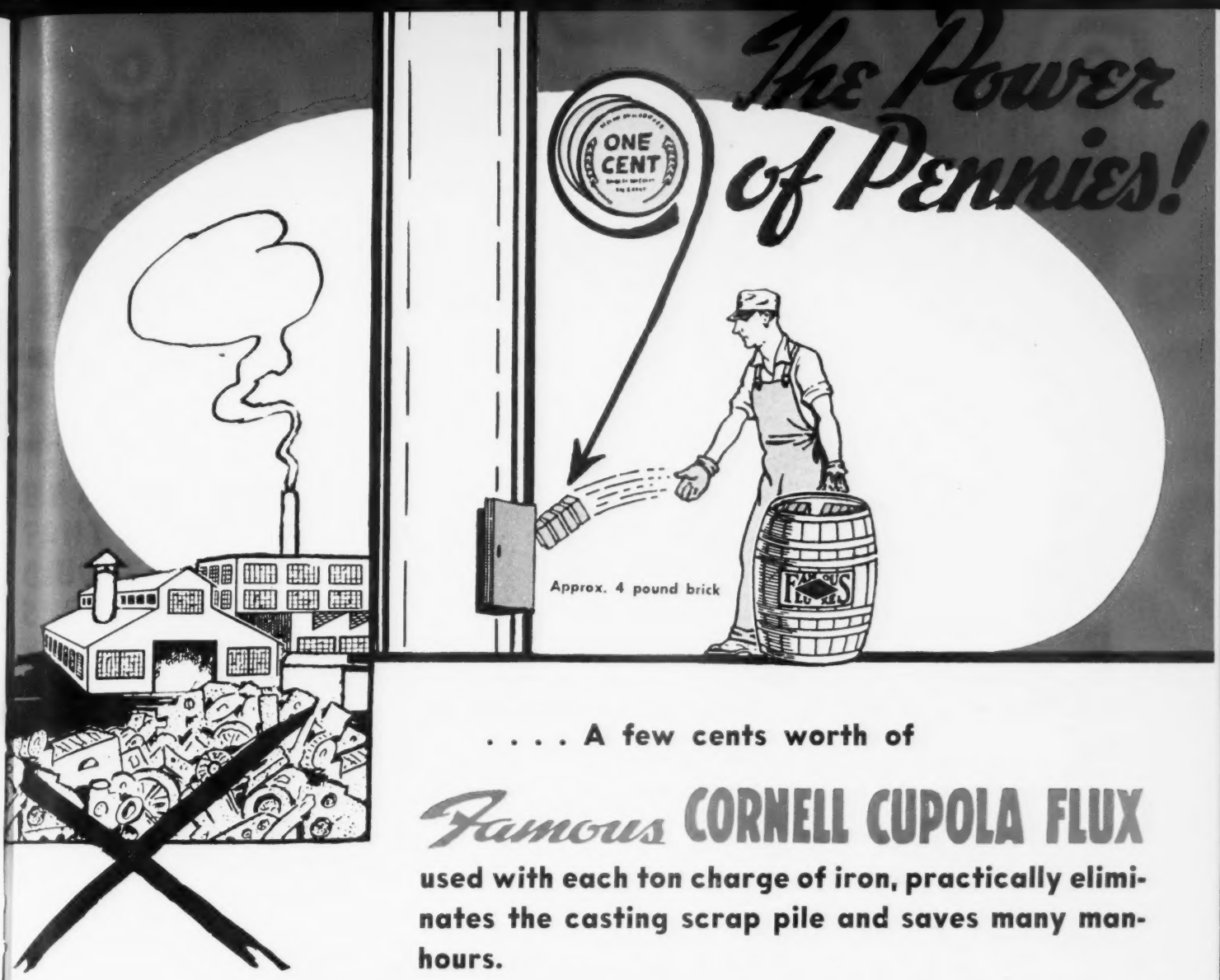
♦ ♦ ♦

Robert M. Parke, for the past year associated with the Metallurgy Research Department, General Electric Research Laboratory, Schenectady, N. Y., has been named manager of its materials and processes section, where he will supervise metallurgical laboratory developments and applications. Mr. Parke previously was engaged in metallurgical research with Climax Molybdenum Co., Detroit, Johns Hopkins University and Battelle Memorial Institute, Columbus, O.

♦ ♦ ♦

Allan V. DeMarco has been appointed general manager of the Foundry Division, Hills-McCanna Co., Chicago. A graduate of Boston College, Mr. DeMarco was previously associated with A.R.D. Corp., New York, and Exeter Brass Division of Bridgeport Brass Co., Exeter, N. H.

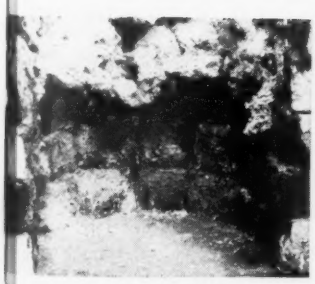
The Power of Pennies!



. . . . A few cents worth of

Famous CORNELL CUPOLA FLUX

used with each ton charge of iron, practically eliminates the casting scrap pile and saves many man-hours.



THE CUPOLA before using Famous Cornell Cupola Flux.

THE CUPOLA where famous Cornell Cupola Flux is used.

Famous Cornell Cupola Flux affords real protection for cupola lining, and greatly reduces maintenance time and labor by keeping cupolas cleaner. Life of cupola lining is prolonged by a glazed or vitrified surface which is formed on brick or stone.

FOR PROOF we'll gladly furnish you with names of gray iron foundries and malleable foundries with cupolas, nearest you. Many of our customers have been enthusiastic boosters for years. You can gain a lot from their experience.

Famous Cornell Cupola Flux cleanses molten iron and makes it more fluid. Castings are sounder, cleaner and easier to machine. Sulphur is greatly reduced and slag is kept fluid.

Famous Cornell Cupola Flux costs but little to buy and the labor in using is practically nil. Simply lift out of container and toss it into cupola with each charge of iron—that's all.

WRITE FOR BULLETIN NO. 46-B

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions.

YOU need this

BULLETIN 104

LINE ANY INSTALLATION **CAST** ANY SPECIAL SHAPE

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for Heat Treating Furnaces
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Annealing Ovens
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FOR SERVICE FROM 0° TO 3000° F.

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NATIONAL METAL CONGRESS AND SHOW

To Be Held in Cleveland, Oct. 17-23

HAVING as its theme, "Metals Market Place of the World," the 35th national Metal Congress and Exposition will be staged in the Public Auditorium, Cleveland, Oct. 17-23. The congress is under the joint sponsorship of the American Society for Metals, American Welding Society, Institute of Metals Division of American Institute of Mining & Metallurgical Engineers, and the Society for Non-Destructive Testing.

Each of the participating organizations has arranged technical sessions devoted to the discussion of recent advancements in its respective fields. Annual seminar of the American Society for Metals will be held morning and afternoon on Saturday and Sunday, Oct. 17 and 18. Topic of discussion is "Relation of Properties to Microstructure."

Numerous Exhibits—More than 400 companies engaged in the production of metals, their treatment or fabrication, or companies serving those industries will conduct exhibits during the week and the eighth metallographic exhibit will be held in conjunction with the exhibit. Micros to be judged will include tool steels and tool materials; stainless and heat resisting steel; other steels and irons; and nonferrous metals and their alloys. Micros illustrating in series the transitions during processing; surface phenomena; results obtained by unconventional techniques; slags, oxides and inclusions; welds and other joining methods. A committee of judges will award first prizes consisting of a medal and blue ribbon, also honorable mentions to the best entries in each classification; a grand prize of a certificate and $100 in cash will be awarded the exhibitor whose entry is considered best in the show.

ASM Awards—During the annual ASM dinner, three awards will be made to men distinguished in the field of metals. Recipient of the 1953 Albert Sauveur achievement award, which was established by the American Society for Metals in 1934 in honor of Dr. Albert Sauveur, is William T. Ennor. Assistant director of research, Aluminum Research Laboratories, Aluminum Co. of America, Mr. Ennor is an authority on nonferrous metals and is responsible for development of direct chilled ingot for large-scale production use. He is a graduate of the University of Wisconsin and has been associated with the Aluminum Co. of America since 1924. He holds many patents on the processing of aluminum and its alloys.

Dr. George Sachs, director of metallurgical research, Institute of Industrial Research, Syracuse University, Syracuse, N. Y., has been named recipient of the society's gold medal award in recognition of his "outstanding metallurgical knowledge and exceptional ability in the diagnosis and solution of diversified metallurgical problems." Dr. Sachs is a Russian by birth and was educated in Germany. Before coming to this country he taught in German universities and was in charge of research activities for metalworking companies in that country. He has been associated with Syracuse University since 1952.

The ASM medal for the advancement of research this year is being awarded to Hiland G. Batcheller, chairman of the board of Allegheny Ludlum Steel Corp. This award is to recognize executives of organizations whose principal activity is the production or fabrication of metals, who over a period of years have consistently sponsored metallurgical research or development and have made available financial support to advance the arts and sciences related to metals.

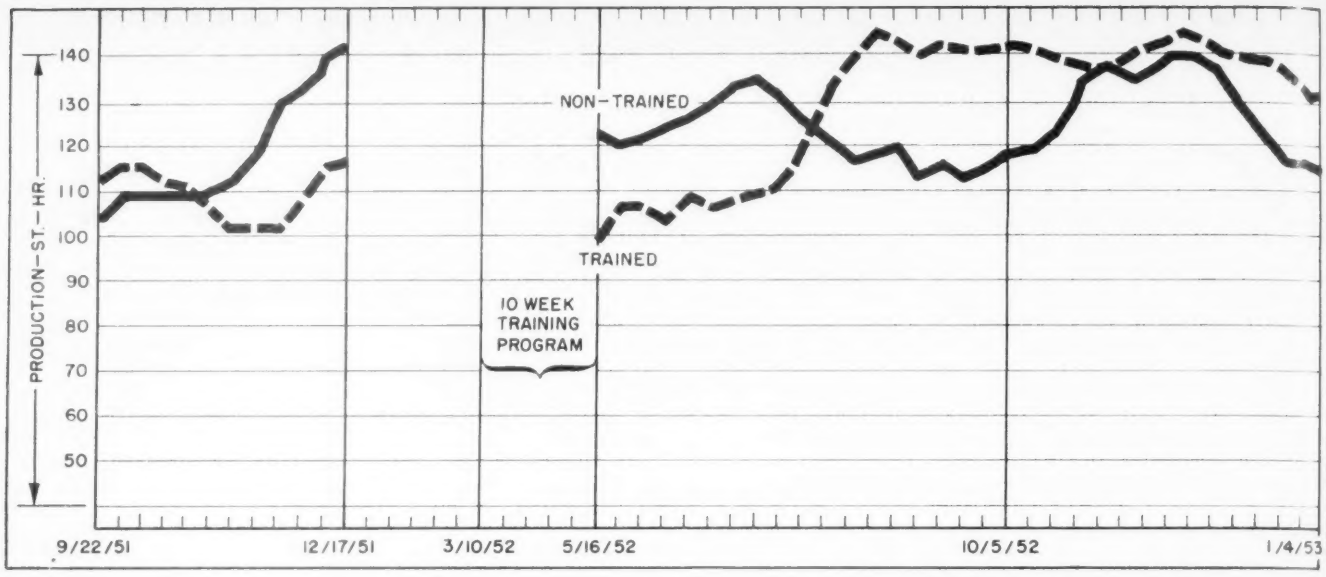
Retiring president of the American Society for Metals is Ralph L. Wilson, director of metallurgy, Timken Roller Bearing Co., Canton, O. J. B. Austin, director of reasearch laboratories, U. S. Steel Corp., Kearny, N. J. is president-elect and George A. Roberts, chief metallurgist, Vanadium Alloys Steel Co., Latrobe, Pa., will be vice president.

Book Review

The Joining of Metals, paper, 174 pages, 5½ x 8½ in., published by the Institution of Metallurgists, 4 Grosvenor Gardens, London S.W. 1, England, Price 14 s.

Comprising six lectures delivered at the Institution's 1951 refresher course by noted British metallurgists, the subjects and authors include: "Metallurgical Principles of Joining of Metals" by Hugh O'Neill; "Metallurgy of the Welding of Nonferrous Metals" by W. K. B. Marshall; "Metallurgy of Welding of Carbon and Low-Alloy Steels" by L. Reeve; "Metallurgy of Welding of the Cr Ni Austenitic Steels" by F. H. Keating; "Metallurgy of Soldering and Brazing" by J. C. Chaston, and "Determination of Weldability" by J. B. Ball.

Cleveland's Public Auditorium, site of the 35th National Metal Congress and Exposition, Oct. 17-23



Graph showing production records, before and after training period, for trained and untrained groups at Builders Iron Foundry, Providence, R. I.

Accelerated Training Program Pays Off

By AHTT A. ERKKINEN, *Foundry Superintendent*
Builders Iron Foundry, Providence, R. I.
and D. JAN DRESSELHUYS, *Engineer*
Raadgevend Bureau Berenschot, Amsterdam, Holland and New Rochelle, N. Y.

IN THE course of 133 years since Builders Iron Foundry began operations, it has produced a wide variety of castings. Special emphasis in the last 50 years has been on metering and instrument products for the water works and sewage treatment industry—in particular, the venturi tube, rate of flow controllers, etc. While the company is one of the major producers of flow metering equipment, 50 per cent of its foundry production is general jobbing items, with the Meehanite process used throughout.

As might be expected, with a wide range of products, the type of molding work in the shop is quite varied. In foundries where workers can be assigned to repetitive operations, a high degree of skill can be developed, but in general jobbing foundry operations, to obtain maximum production with a minimum of scrap, the workers must become highly skilled in many and varied operations. Unfortunately, this "universal" skill is not learned by apprenticeship, nor does it automatically develop with experience.

This does not mean to imply that the workers in a general jobbing foundry are not skilled or experienced, but even the workers will admit that the ability to handle some highly specialized products is less than the skill which they have for handling items which are routine.

In the field of employee education Builders Iron Foundry uses work simplification and training programs. It is in this latter category that the accelerated training system appeared to offer possibilities for improving production in the foundry, and it is this program which is described in this article.

Accelerated Training—By way of explanation, the accelerated training method was devised and developed by a Dutch firm of management engineering consultants, Raadgevend Bureau Berenschot (abbreviated RBB). This system of training courses was introduced into Dutch industry after World War II and the firm has since conducted more than 230 courses in many industrial fields.

(*Continued on page* 150)

Theoretical explanations about gating and risering, sand conditioning, coremaking, patternmaking and handling, etc., were part of the course

IMPROVED annealing cycles

through

A. P. GREEN *Engineered*

REFRACTORY LININGS

Oil-fired annealing oven for malleable castings. The flat suspended arch is KAST-O-LITE and the sidewalls are G-23 Insulating Firebrick.

Malleable operators report easier controlled annealing cycles through the use of the proper combination of A. P. Green refractories. Efficient furnace operation means lower production costs and better control of the physical properties of the castings. It can only be achieved by a refractory enclosure which contributes to the desired annealing cycle.

A. P. Green KAST-O-LITE insulating refractory castable was used throughout sidewalls and arch for this pulverized coal-fired oven.

The two ovens illustrated are typical examples of A. P. Green engineered refractory linings. One is a complete monolithic lining of A. P. Green KAST-O-LITE, a light weight castable refractory. The other is a combination lining—KAST-O-LITE arch and G-23 Insulating Firebrick sidewalls. Both have excellent performance records effecting improved product quality at reduced fuel costs.

The A. P. Green Fire Brick Company Engineering Department will assist you with further information on the application of these materials to new units or the conversion of existing furnaces. Call your local A. P. Green distributor . . . he's listed in the yellow pages of your telephone directory . . . or write . . .

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DISTRIBUTORS IN THE PRINCIPAL CITIES OF THE WORLD

The technique of side floor molding being explained to trainee group

(*Continued from page* 148)

in Holland, Sweden, Norway, Indonesia, Australia, and Israel. In 1952, Builders Iron Foundry was the first American company to employ RBB to conduct a course. Since that time RBB has conducted courses in the textile and newsprint paper fields in the United States.

Although the system is called an accelerated training program, it is also known as a retraining program or a skill development program, as it has some relation to each of these ideas. The system can be applied to any industry. It consists basically of studying the craft or industry and breaking down the production process into individual steps (known as keypoints or operations) and then developing the best way to perform each step, with the workman learning or developing his skill as he works.

In order to understand, fully, the concepts of accelerated training, it is necessary to compare it to other training methods.

Apprenticeship, in the widest sense of the word, means to learn a craft. It involves a two to four-year period, and apprentices are usually young people without previous experience. Apprentice training is partly done in a school and partly in production, with groups consisting of up to 30 persons instructed by skilled craftsmen, who may or may not have a theoretical background.

Walk-Along Training is the conventional method of breaking in a new worker on the job in the course of regular production. The time to complete the training may require from one to seven years, depending entirely on the complexity of the craft involved. In this system, a new worker is placed with a skilled worker and spends most of his time looking on.

This is not an efficient method of training, since results depend on the willingness of the skilled worker to take time out to explain the work. The method has the further disadvantage that the steps taken in breaking in the "green" worker depend entirely on the production work which the skilled worker is handling at the time. This type of training is individual and involves no groups.

Training Within Industry, or T.W.I., is an excellent method for breaking in new workers on a simple repetitive job. It is also used for additional training of already trained personnel. The time involved with T.W.I. instruction varies from one to five days. The number of keypoints, or operations, involved in T.W.I. is generally no more than 25. T.W.I. is performed during production and thus is on-the-job training. The instructor has to be taught to perform this job by a T.W.I. trainer. T.W.I. was used in U. S. industry during World War II to break in workers to handle mechanized operations, particularly where the workers were recruited from various occupations and frequently were unfamiliar with mechanization.

Accelerated Training may be used to train "green" workers in simple or complex crafts; it may be used to "retrain" trained workers, or to

(*Continued on page* 152)

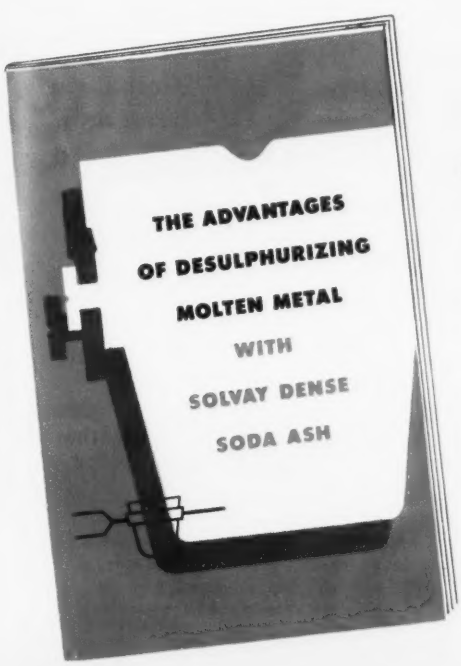
Coremakers received 200 hours of instruction, mostly on productive work

Desulphurization with SOLVAY DENSE SODA ASH

✓ Offers Many Advantages

✓ Costs Less

SOLVAY DENSE SODA ASH is especially effective for desulphurization. This 100% active material helps produce better, more fluid metal . . . and gives you these other advantages: it's free-flowing; the small grains melt very rapidly, allowing faster, more uniform dispersion; and it's easily added by means of simple equipment. The use of Solvay Dense Soda Ash is a flexible one—you use only as much as you need. And remember, Solvay Dense Soda Ash is the *low cost* form of desulphurization!



Further Information Contained in Valuable Book—Available on Request

"The Advantages of Desulphurizing Molten Metal with Solvay Dense Soda Ash" has been published by Solvay for the benefit of the foundryman. It contains important information on the advantages you can gain by desulphurizing with Solvay Dense Soda Ash. It also explains what type of equipment is needed and how to obtain it. This book is available free—on request—by simply writing to Dept. F10. Be sure to get your copy.

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Sodium Bicarbonate . Snowflake® Crystals . Para-dichlorobenzene . Monochlorobenzene
Ortho-dichlorobenzene . Ammonium Chloride

(*Continued from page* 150)

improve or develop the skills of trained workers. Whereas T.W.I. instruction can cover only approximately 25 keypoints or operations, accelerated training can cover up to 2500 keypoints or more, because it teaches an entire craft. As the name implies, results are obtained in a relatively short time. The time for training in various crafts depends largely on the complexity of the craft involved and may vary from two weeks to three months.

Accelerated training is used for training personnel for a particular plant and is tailored to the specific needs of the company involved. Groups of six to twelve persons are instructed at one time. The instructor is selected from the ranks of skilled workmen in the department where the training is needed, and is trained for this special instruction work. This training is not on-the-job training in the usual sense as will be understood from the description which follows. Basic principles are these:

Concentration on Experience—Allow trainees to practice a certain operation sufficiently long so that they acquire both skill and experience. Allow mistakes to happen during the course so that trainees will meet all the circumstances they may possibly expect in their regular work. For example, cause a run-out, on purpose, so that trainees may know what happens, what to do about it and how to prevent it.

Step-by-Step Instruction — From the simple to the complicated; never proceed with any complex item until the previous more simple item has been mastered.

Sound Human Relations—Present sound and thorough information about company policies and company organization as part of the course.

Discussion Method of Instruction—Better estimation of an individual's ability is possible from open discussion, and the individual develops the feeling of participation in decisions and organization.

Group Instruction — Teamwork is stimulated by group instruction. The less skilled worker will do his best to come up to the performance of a better trainee, and healthy competition is created.

Quality First, Quantity Later—Teach the trainee first how to do the job to obtain the best results and later teach the speed with which it has to be performed.

A Selected and Trained Instructor—While it is recognized that some persons are born instructors, far more are developed from skilled personnel.

Sell Idea to Workers—Sound information presented properly about the system to the line organization, union officials and ranks is essential in order to "sell" the training system to the plant personnel.

Thinking Is Basic—Not only "doing" but thinking and doing makes a craftsman. Thought patterns, quizzes, etc. are used to develop and practice basic thinking with respect to the job at hand.

Follow-Up—A follow-up for every course is necessary so that the trainees after the course, do not feel themselves "lost" in the production work.

Tool of Productivity—This accelerated system is developed entirely in such a way that the company can handle the course with its own staff for repeat training sessions of other personnel, without decreasing the efficiency of the course.

Course Organization — The first step in developing an accelerated training or skill development program is a thorough analysis of the complete craft involved. This an-

(*Concluded on page* 154)

How To Do It . . .

Making Plain Cylindrical Cores Without a Corebox

By F. J. McCULLOCH
Yorkshire, England

Editors' note: This item was abstracted from *Foundry Practice*, house organ published by Foundry Services Ltd., Birmingham, England.

WHEN a few cores are required for a limited number of castings, construction of a corebox is a relatively expensive item compared with the cost of one similar in design for producing large numbers of cores.

If the core required in the short production run is of a plain cylindrical shape, the cost of making a corebox for producing the small number of sand cores can be avoided by fabricating a core from a piece of steel tube wrapped to the required diameter with dry asbestos paper. Outer edge of the paper surrounding the tube can be fixed in position by applying a few daubs of core gum or a few turns of fine wire.

In producing the flanged part shown at right in the illustration, the core (left) was placed in the mold with its ends resting in core prints of suitable size. The mold was poured in the vertical position, flange uppermost, through a single downgate with two ingates connected to the perimeter of the flange.

Stripping of the core is accomplished readily because of the reduction in bond strength of the asbestos paper when heated by the molten metal.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $10 for each idea submitted and published. Send a photo or drawing with your idea

SPEEDY ROTOR CHIPPERS "PAID OFF" in 29 days

JOB: Cleaning off excess metal from base plate castings for printing presses. Men on incentive. Rigid inspection. Were using 14¾-lb. hammers—slow and hard to control.

SOLUTION: Rotor Application Engineer recommended new Rotor Chipper. Weighs only 11½ lbs. Easy to maneuver. High speed. Lots of wallop.

RESULTS: Cut rejects. More output per day "paid off" new Rotor Chipper in 29 days.

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SHORTER . . . 1″ to 2″ shorter . . . easier to get into crowded corners.

MATCH YOUR JOB . . . Each basic model can be adapted to three kinds of work.

THE ROTOR TOOL CO.
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

(*Concluded from page* 152)

alysis is done by the representative of RBB, who makes a comprehensive study of the production process and in particular of the various operations of performing the work with a secure and efficient method which will result in a quality product.

The analysis is done mostly by interviews with skilled craftsmen of the foundry, with all observations and conclusions checked by the superintendent and foremen in the various departments. The result of this analysis is a course plan or schedule. The course plan is laid out for the entire period of study (in this case 10 weeks) and includes all of the elements of work which a craftsman has to know to perform a good job. These elements include items in the categories of basic operations, molding, job knowledge, and general information.

The second step is the preparation of a manual to explain to the selected instructor how to handle the various course items, and to show how much time should be spent on each item, and what presentation procedure to use.

The third step is the selection of the instructor, bearing in mind that the selection of the proper person is vitally important to the success of the program. No system is better than the man who handles it and it is well to remember that the most skilled worker is not always the best teacher.

The fourth step is the breaking in of the instructor on how to perform good instruction and how to handle the course, etc. This step requires approximately five sessions of two hours each before the course starts. During the course the instructor is not left on his own; a part of his "breaking in" continues during the entire course, with the consulting engineer acting as mentor and guide. To insure the success of the course, the consulting engineer representative of RBB puts every effort on emphasizing that a training system will work successfully only if it is properly introduced, carefully explained, thoroughly understood and followed-up by plant management and the line organization.

How It Works—At Builders Iron Foundry, eight molders of the bench, rollover, and floor molding department were selected and taken into this program. The men selected were picked as representative of the general workmen, men who were not unskilled but who lacked broad experience and who showed that further skill could be developed.

The course lasted ten weeks, during which time the men were taken off of their regular work entirely in order to devote their entire production time to the training program. Out of 400 hours of instruction 70 per cent was devoted to production work. One of the goals was to develop in the molders more all-around skill, hence a selection was made of every type of work in the departments from which the trainees were recruited.

Theoretical explanations about gating and risering, sand conditioning, coremaking, patternmaking and handling, etc., were held regularly. This so-called job knowledge is necessary to enable workers to understand better the "why" of the necessary operations and methods to be used. At the end of each day, a discussion period was held to give trainees the opportunity to ask supplementary questions about operations which received instruction and practice on that day.

Another advantage of the question period is that it creates sounder human relations because the opinions of men who have been on the job a considerable time are available to the trainees, and active participation in these discussions is the first step to better human relations in the industry. Tests and quizzes are used regularly once a week so that the trainees and the instructor can measure the progress and determine what had to be repeated for a complete understanding.

Gradually during the course, the time for productive work was lengthened and less theory was given to allow the trainees to become accustomed to the regular all-day production schedule, which starts at once after the course is completed. The practical part of the course was done in a training area away from the production line and properly equipped for training. Theory was given in a separate room where a blackboard and the necessary visual aids were available.

"Would you mind raising it a second—just until I can get my foot out?"

At the same time as the ten-week course for molders, a six-week course was presented for coremakers, with four men attending. Out of 200 hours of instruction in coremaking, 70 per cent was spent on productive work, the remainder on instruction in theory.

Did It Work?—The proof of any pudding is in the eating, and concrete results obtained by the accelerated training program are shown in the accompanying chart. It is apparent that before the training period, the trainees had a production record varying from approximately the same to less than the average of other personnel.

After the training period, the trainees were slow to pick up their production, but gradually they got into the swing of things and showed a production level well above that of the nontrained group. Furthermore, the trained group maintained this high level of production while the production of the nontrained group fluctuated considerably. The trained group showed no increase in scrap losses percentagewise, although their production was higher than before.

While these can be considered the direct and concrete benefits of the training program, there were also many intangible benefits. Shop superintendents and foremen feel that the trainees are better equipped, theoretically, they avoid mistakes they formerly made, and have more self-confidence. The trainees themselves feel that they have improved their knowledge as well as their skills, that they have a better understanding of other departments, and that they have broader experience and increased confidence.

These intangible benefits, alone, would seem to make the program worthwhile and worth following up with similar training periods for other personnel.

Plans Plant Addition

Hartford Electric Steel Corp. plans construction of a one-story addition, 30 x 150 ft, to the main plant at 540 Flatbush Ave., Hartford, Conn. Estimated cost of the new facility is $30,000.

MR. C. M. DALE,
Vice President

LIBERTY FOUNDRIES CO.

Mr. Dale reports: "The Dustube Collectors have been a profitable investment for many reasons: (1) they effectively control all dust, making our foundry a better place to work. (2) Dust formerly exhausted into the neighborhood is now collected. (3) Dustubes cost less to operate and maintain."

MR. JAMES REDDRICK,
Superintendent of Maintenance

OLIVER CORP.

This company uses one large Dustube Collector to ventilate 6 double end grinders, 6 tumbling mills, a Wheelabrator Cabinet and 2 Wheelabrator Tumblasts. Mr. Reddrick says: "The Dustubes are the most trouble-free units in our whole plant. We have not spent a dime for repairs in years."

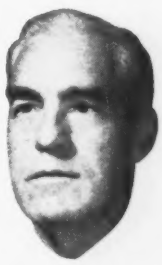
A 4-FOUNDRY REPORT on DUST CONTROL

MR. A. E. PORTER
Manager

HOWARD FOUNDRY CO.

Semi-Steel Div. — Six grinding stands and 5 pieces of casting cleaning equipment are ventilated by a Dustube Collector. Mr. Porter reports: "In terms of efficiency and cost saving performance, our Dustubes are the best investment we have ever made." Dust counts show all harmful dust exhausted.

MR. I. C. SHEPPARD
Works Manager



BEACH FOUNDRY, LTD.

More than 29,000 C.F.M. are handled in 3 Dustube Collectors in this modernly equipped gray iron foundry. Although operations ventilated are the foundry's heavy dust creating processes, a survey by independent engineers revealed the dust count in the cleaning department was exceptionally low.

Catalog 372 explains reasons why Dustube Collectors control dust more efficiently at lower cost. Send for your copy today.

All four of the foundrymen above agree on one point: "Although foundry dust is expensive and troublesome, it can be controlled effectively and economically with Dustube Collectors." They have found that Dustubes remove dust with virtually 100% efficiency from the heaviest dust creating operations. And, in spite of their efficiency, operating and maintenance costs for these collectors are exceptionally low.

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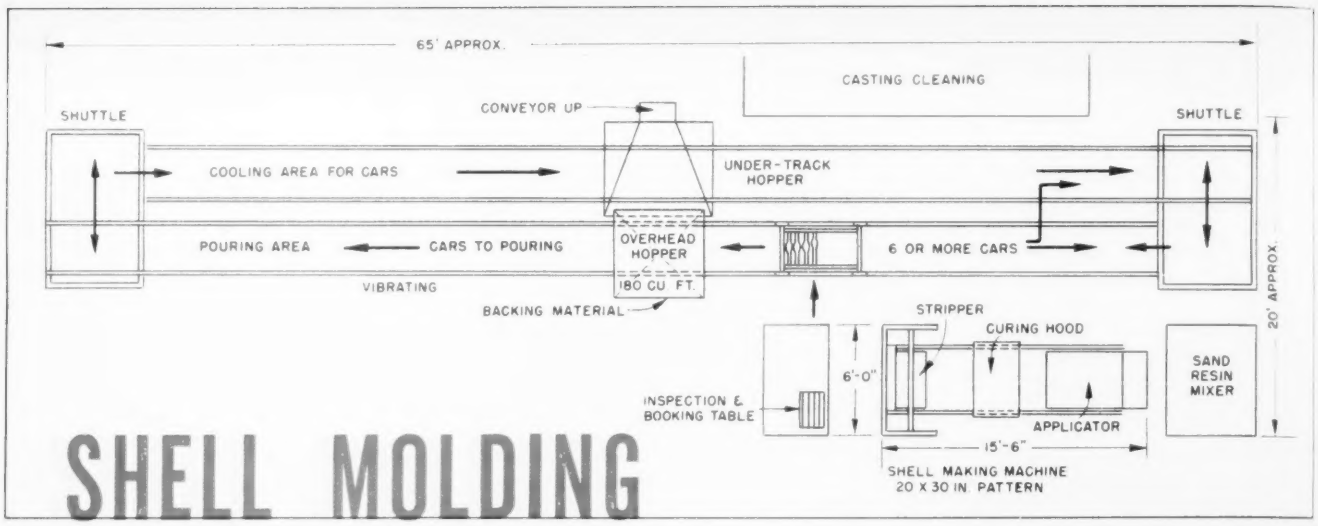

SHELL MOLDING

• • • What Does It Cost?

Typical layout for shell mold foundry requiring six to eight men. Production would approximate that shown in table below

By WALTER W. COLEMAN
Vice President
Southern Shell Mold Equipment Co.
Chattanooga, Tenn.

IN ATTEMPTING to evaluate the shell mold process for his own use, the foundryman is required to collect a wide variety of information, which in some cases is so sketchy and little publicized that it is difficult and laborious to assemble.

The purpose of this article is to attempt to list the requirements for evaluating the shell mold process in terms of any specific range of castings. The methods and processes described here are being used in production foundries, both jobbing and captive.

Types of Castings—The first question generally asked by foundrymen who are unfamiliar with the process is: "What type of castings can be made in shell?"

It is doubtful if anyone knows the limit in any direction from a technical standpoint. Four-hundred pound castings have been successfully poured in steel at 3000° F. Complex shapes have been successfully poured by using segmental shells and putting them together like a jigsaw puzzle. It is unlikely that the ultimate has been achieved in dimensional tolerance. Excellent finishes are commonplace.

This very promising future for shell molding can only be realized after developing know-how, which is more easily and economically done with castings having certain characteristics. The most desirable situation would be to produce castings in shell that cost no more than the same castings in green sand. Under these conditions, the closer tolerance and better finish available in shell would be plus items obtained at no increased cost. When the ratio of casting weight to shell weight is favorable, such a condition exists. The general manager of one large jobbing concern producing shell mold castings places this ratio at two and one-half to one. Under an efficient method of operation, the ratio could be lowered.

If the casting-shell weight ratio is definitely unfavorable for competition with green sand on a pound for pound basis, then the foundryman must choose castings for shell that have one or more plus values. These are:

1. Improved finish
2. Closer dimensional tolerance.
3. Elimination of core setting in many cases.
4. Making castings of such com-

(*Continued on page* 158)

Breakdown of Costs in Producing 2½-lb Gray Iron Crankshaft

	Equipment Producing 30" x 50" Shell		Equipment Producing 20" x 30" Shell	
Weight of entire shell	15 to 20 lb	Average 17½ lb	6 to 8 lbs	Average 7 lb
Castings produced per shell	20		8	
Cost of sand per shell	17½ lb, $15 per ton =	$ .131	7 lb, $15 per ton =	$ .052
Cost of resin per shell	.875 lb, 32c per lb =	.28	.4 lb, 32c per lb =	.128
Total cost of shell material		$ .411		$ .180
Labor	7 persons, $15 per day per person, divided by shells produced: $105/480 =	.219	6 persons, $15 per day per person, divided by shells produced: $90/480 =	.19
Release agent, heating, etc.	$20/480 =	.04	$10/480 =	.02
Total direct cost to produce castings contained in one shell, less metal		$ .67		$ .39
Cost per casting of gray iron, 4c per lb		.10		.10
Total direct cost of crank shaft	$0.67/20 plus .10 =	$ .1335	$0.39/8 plus .10 =	$ .1488

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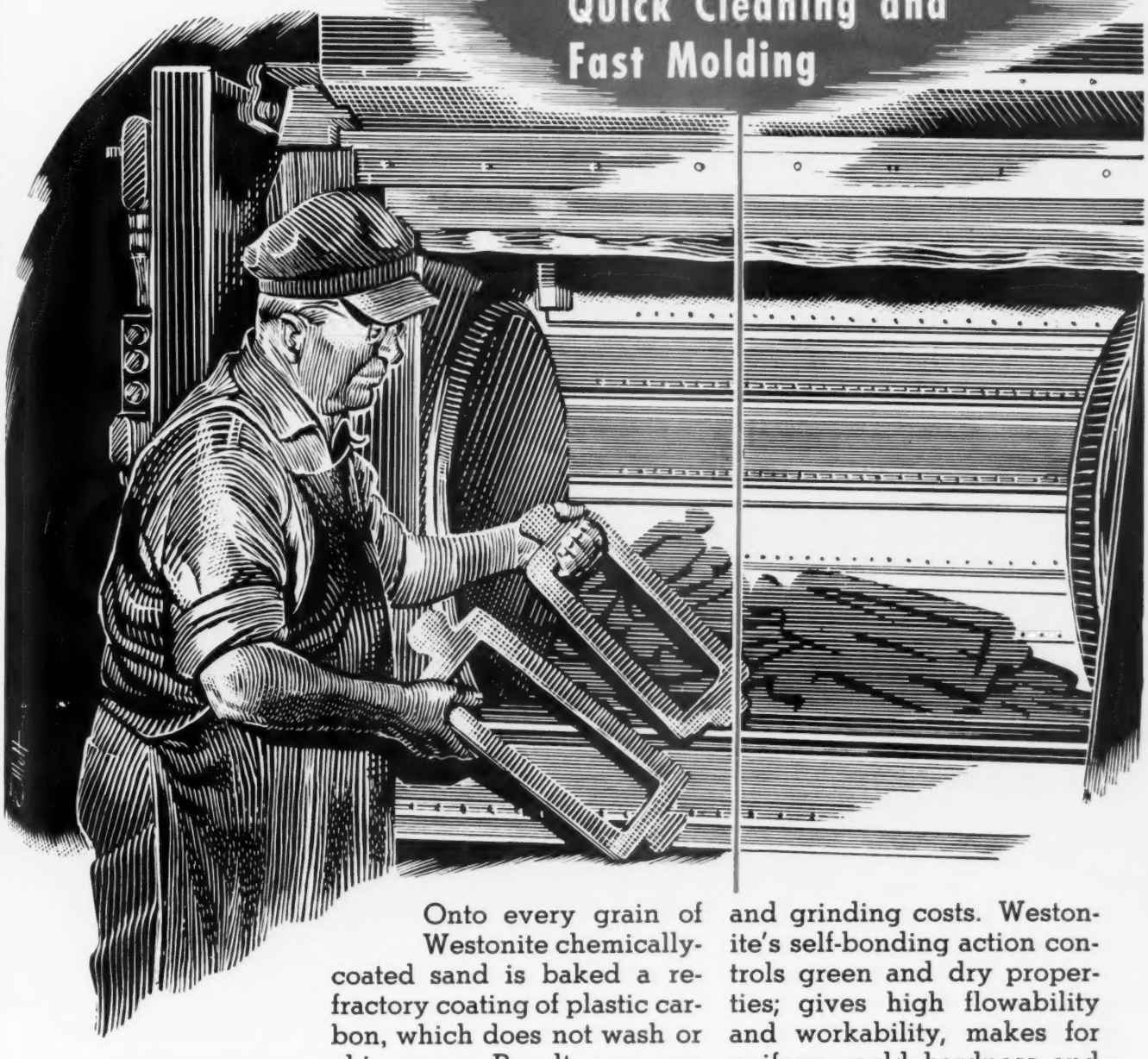

Onto every grain of Westonite chemically-coated sand is baked a refractory coating of plastic carbon, which does not wash or chip away. Result: no more burn-in, cleaner and smoother castings, lower cleaning and grinding costs. Westonite's self-bonding action controls green and dry properties; gives high flowability and workability, makes for uniform mold hardness and exact pattern reproduction; speeds up molding.

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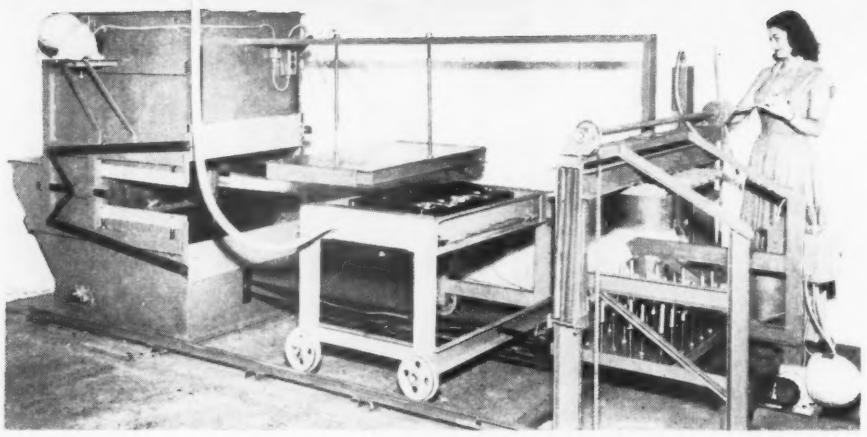


One type of machine for making, curing and stripping mold shell

(*Continued from page* 156)

plexity of shape that they could not be readily made in green sand.

5. Reduction in casting weight, and greater yield.

Economic Evaluation—While the information above offers encouragement to a foundryman investigating shell molds for his own use, further information necessitating certain assumptions is required to permit an actual economic evaluation. We will leave for later discussion shell making and handling equipment, assuming that required equipment is at hand.

Labor costs are listed in the accompanying table at $15 per day per person. (Note "man" was not used, since many of the functions can be efficiently performed by women.) The sand cost is shown as $15 per ton, and resin is listed at $0.32 per pound. All these costs are for comparison purposes only, since the labor and sand costs will vary considerably in different areas. Two sets of figures are shown, one for shell making equipment producing one 20 x 30 in. shell (which may be one-half mold 20 x 30, one complete mold 15 x 20 or two complete molds 10 x 15 in.) per minute, and the other set of figures for shell making equipment producing one 30 x 50 in. shell (which may be one-half mold 30 x 50, one complete mold 25 x 30, two complete molds 15 x 25 or four complete molds 12½ x 15 in.) per minute.

The evaluation shown is for production of a crankshaft 10 in. long, weighing 2½ lb. The sand resin mix is calculated for 5 lb of resin for every 100 lb of sand. The labor costs are for the entire production of the castings considered, including mixing of sand and resin, shell making, shell assembly and inspection, preparing for pouring, melting, pouring, shaking out, preparation for shipment.

The direct cost of any casting can be calculated in a similar manner by determining the number of castings that can be produced from the plate area under consideration, the weight of the casting, and substituting these figures properly in the table. The variation in weight of the shell due to different shape castings is insignificant unless the casting patterns stand very high on the plate or very low on it. In other words, if there are large vertical areas the weight of the shell may be increased somewhat.

What Size Run?—Another question often asked is: "What is the shortest production run that I can profitably put into shell molding?" This can be determined from the following:

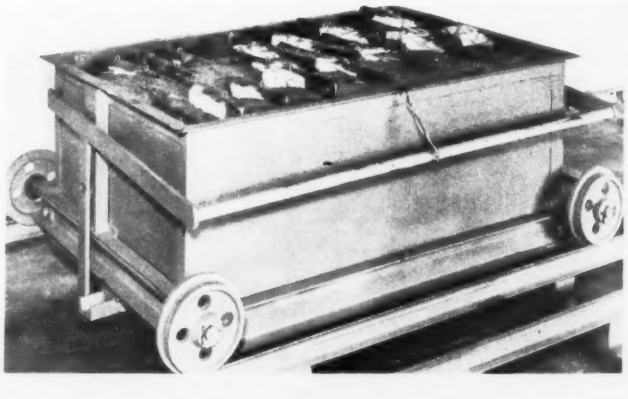
1. Cost of pattern equipment.
2. Time required to change patterns.
3. Is casting one that will require considerable machining?
4. Is metal to be poured exceptionally difficult to machine?

Pattern costs for shell molding are increased over a good metal pattern for green sand by the following factors:

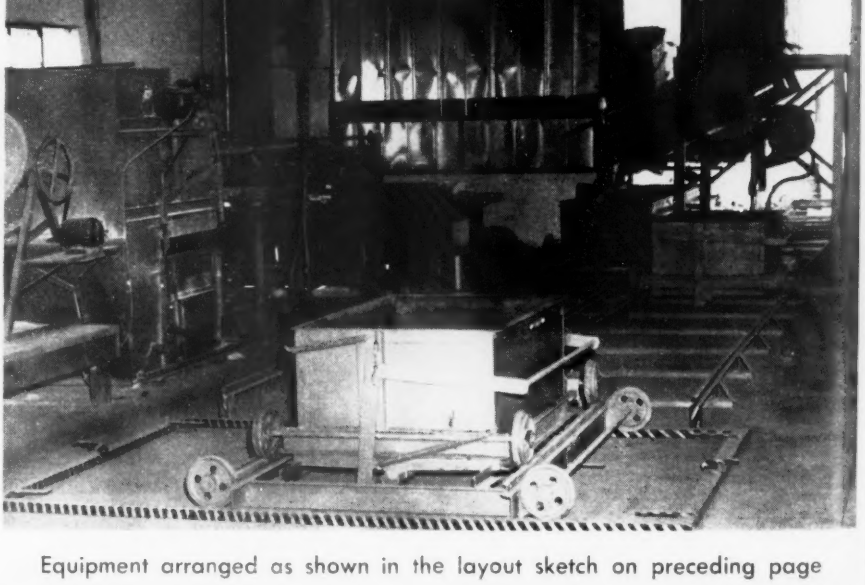
1. Greater precision if close tolerance of the shell mold is required. Where close dimensions are of no consequence, time spent in working the pattern down to extremely close tolerance is wasted.

2. The time and material required for rigging a shell mold pattern. This includes installation of ejector pins, springs, etc.

(*Continued on page* 190)

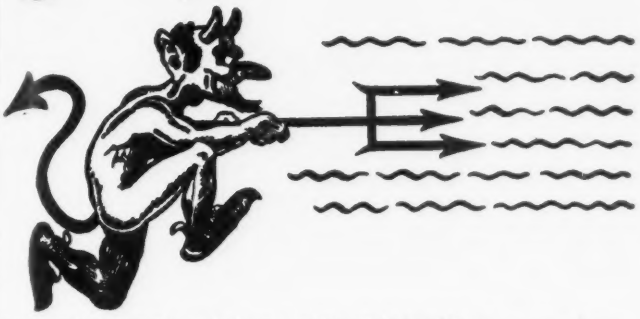


Pouring container for holding molds has provision for bottom dumping of backing material



Equipment arranged as shown in the layout sketch on preceding page

Soffel's



FLUXES and EXOTHERMIC COMPOUNDS

for all

Metals and Alloys

THERMOTOMIC "X" COMPOUND is an exothermic material which is molded and baked into necked down riser cores and inserts. It produces a temperature of 3500° F. and is used as ring inserts under the risers or feeding heads. Great savings are realized through reduced riser dimensions and cleaning costs. In conjunction with Thermotomic Compounds Carbon Free Liquidizer No. 5 should be used on top of the metal in the heads.

THERMOTOMIC ABC—For aluminum and magnesium castings, necked down riser cores and inserts—prevents piping and shrinkage into castings. Soffel's ALX-31 Liquidizer should be used on top of the metals in the head.

THERMOTOMIC HoTop LIQUIDIZER — For short risers—save 60 to 70% of feeding metal in the heads.

EXOTHERMIC CARBON FREE LIQUIDIZER A feeding head compound for castings and ingots of ferrous and non-ferrous metals—saves metal and prevents piping and shrinkage.

CARBON FREE LIQUIDIZER AL-X31—For aluminum and magnesium feeding heads—prevents piping.

EXOTHERMIC INSULATING SLEEVE CORE COMPOUND—For riser sleeves—adds heat and prolongs fluidity of feeding metal in heads or risers.

DENSILTITE LADLE FLUX—For iron and semi-steel—reduces sulfur and phosphorous. Adds fluidity and temperature in pouring ladles—produces clean iron.

SOFFEL'S NON-FERROUS FLUXES

BB-2—For red brass, nickel and tin bronze pressure castings—removes sulfur, iron, phosphorous oxides and gas from brass and bronze.

SUPER BRASS FLUX—For brass and bronze—Prevents oxidation of zinc.

BRASS REFINING FLUX—For cupola melting and open flame furnaces—prevents oxidation. Produces liquid slag and faster melting.

COVERALL BRASS FLUX—Removes gas and oxides from yellow brass and nickel silver.

RADIOCLARITE BRASS FLUX—For open flame furnace melting—increases fluidity, tensile strength, removes gas, oxides and iron.

AB-6 BRASS FLUX—For electric furnace melting of brass and aluminum bronze—keeps furnace linings clean.

KLEEN-ALL BRASS CLEANER—For use in bottom of pouring ladles or open flame furnaces to absorb liquid slag and keep the furnace and ladle linings clean.

BRASS ALUMINUM REMOVER—Removes all traces of aluminum from copper, brass or bronze.

HI-LED BRONZE FLUX—Holds lead up to 50% in copper without use of nickel.

NICKEL MONEL FLUX—Removes gas and adds fluidity to metal.

ALUMINUM BRONZE FLUX—A perfect deoxidizer for reducing aluminum and iron oxide in manganese bronze and aluminum bronze. Adds fluidity.

COPPERTITE FLUX—For high conductivity castings—removes cuprous and cupric oxides and gas from copper.

FERRO-OUT IRON REMOVER—Removes free iron or alloyed iron from brass, bronze or copper.

SOFFELITE ALUMINUM FLUX—Removes aluminum oxide and iron from aluminum and increases the fluidity and tensile strength.

MAGNALUM FLUX—For magnesium and aluminum alloys — removes gas and oxide and increases fluidity.

KLEN ZINC FLUX—A deoxidizer and purifier for zinc base pressure die castings—removes gas, sulfur and iron.

DIE COATING—For pressure zinc base die castings —will not scale, blister or create gas in the molds.

PERMANENT MOLD COATING—For aluminum and magnesium castings — adds longer life to molds. Produces clean gas free castings.

POT COATING—For iron pot melting — increases life of pots. Prevents iron pick up.

U. S. Patents No. 2,490,327 and No. 2,500,097

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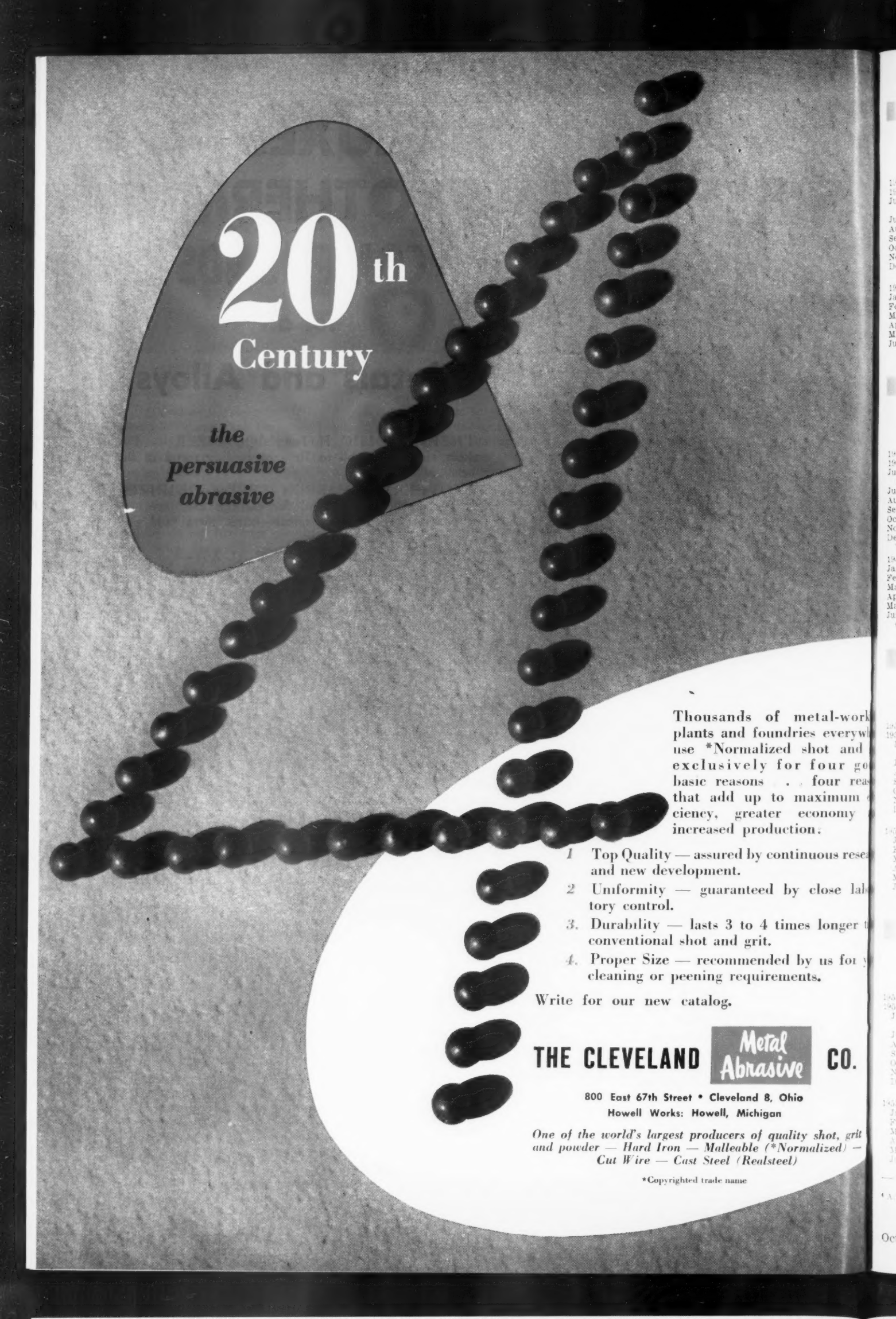

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Foundry Statistics

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1951	1,085,241	656,076	.....
1952			
June	74,446	46,511	173,353
6 mo.	496,347	308,525	.....
July	45,266	29,675	166,517
Aug.	63,716	39,308	162,832
Sept.	75,950	45,849	168,367
Oct.	88,062	52,922	168,609
Nov.	76,099	46,708	167,842
Dec.	80,680	50,485	173,494
Total	926,120	573,472	.....
1953			
Jan.	87,249	53,272	174,809
Feb.	86,515	51,963	175,088
Mar.	94,481	57,025	177,776
Apr.	95,923	57,757	174,514
May	82,050	48,011	160,387
June	86,514	50,819	151,016
6 mo.	532,732	318,847	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1951	515,131	193,378	160,011	151,465	.....
1952[3]					
June	39,867	15,989	10,255	12,657	108,213
6 mo.	247,620	97,513	69,798	75,549	.....
July	35,275	14,014	9,232	11,302	111,518
Aug.	39,197	15,834	10,493	11,730	117,648
Sept.	45,430	16,733	12,515	15,888	127,777
Oct.	51,631	17,826	15,191	18,284	132,624
Nov.	46,483	15,419	13,463	17,372	138,461
Dec.	53,343	17,277	16,191	19,608	146,499
Total	518,979	194,616	146,883	169,732	.....
1953[3]					
Jan.	55,629	19,158	16,147	20,052	142,542
Feb.	54,864	17,583	16,698	20,272	148,557
Mar.	59,423	18,989	17,865	22,255	145,749
Apr.	61,582	20,009	18,583	22,620	141,231
May	57,602	19,600	16,479	21,208	138,037
June	57,305	19,783	15,567	21,675	135,952
6 mo.	346,405	115,122	101,339	128,082	.....

Copper-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Sand	Perm. Mold	Unfilled Orders[2]
1951	1,197,443	1,075,437	69,883	.....
1952[3]				
June	76,768	69,014	4,906	84,363
6 mo.	514,780	462,460	34,118	.....
July	66,177	60,249	3,669	89,662
Aug.	78,798	71,273	5,154	89,310
Sept.	85,815	78,278	4,680	89,034
Oct.	93,102	84,544	5,518	86,779
Nov.	80,439	72,281	5,011	82,393
Dec.	90,799	81,777	5,715	76,871
Total	1,009,910	910,862	63,865	.....
1953[3]				
Jan.	85,781	76,686	5,388	80,793
Feb.	85,183	76,847	5,061	76,578
Mar.	92,798	83,639	5,716	69,490
Apr.	94,362	85,471	5,462	72,291
May	85,223	76,912	4,855	66,926
June	84,691	76,368	4,706	64,500
6 mo.	528,038	475,923	31,188	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1951	30,825	28,090	.....
1952[3]			
June	2,703	2,603	13,132
6 mo.	17,565	16,608	.....
July	2,405	2,303	14,052
Aug.	2,478	2,390	14,288
Sept.	3,090	2,949	16,833
Oct.	3,250	3,070	16,237
Nov.	2,959	2,785	17,053
Dec.	3,110	2,872	16,020
Total	34,857	32,977	.....
1953[3]			
Jan.	3,073	2,825	15,680
Feb.	3,225	3,033	14,834
Mar.	3,362	3,093	13,608
Apr.	3,294	3,046	12,709
May	2,679	2,434	13,635
June	3,136	2,666	13,664
6 mo.	18,769	17,097	.....

Foundry Production Workers

	May 1953	Apr. 1953	May 1952
Estimated Number			
Ferrous	222,800	224,200	224,500
Nonferrous	79,000	81,700	73,800
Average Weekly Earnings			
Gray Iron	$75.26	$76.96	$68.80
Malleable Iron	78.25	78.50	71.18
Steel	80.16	81.73	76.97
Nonferrous	80.56	80.75	74.97
Average Weekly Hours			
Gray Iron	40.9	41.6	40.0
Malleable Iron	41.4	41.1	39.7
Steel	40.9	41.7	42.5
Nonferrous	41.1	41.2	40.7

Labor Turnover Rate (May)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	3.7	4.7	2.8	0.9
Malleable Iron	4.2	4.7	3.0	0.9
Steel	3.1	4.2	2.5	1.0
Nonferrous	5.5	5.4	3.0	1.1

Source: Bureau of Labor Statistics

Gray Iron Castings—Shipments

(net tons[1])

	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Pressure Pipe & Fittings—Total[4]	Soil Pipe & Fittings—Total[4]	Unfilled Orders[2]
1951	14,988,555	8,453,948	9,573,347	4,471,539	2,614,517	1,257,542	639,996	1,473,192	687,503	.....
1952										
June	835,263	502,322	616,895	292,846	19,467	10,575	44,066	103,335	51,500	1,445,521
6 mo.	6,667,139	3,806,392	4,290,605	2,000,300	1,085,024	514,582	298,319	688,091	299,581	.....
July	636,423	431,889	407,757	227,794	14,794	10,223	40,783	96,784	56,305	1,409,684
Aug.	1,001,629	602,025	596,369	295,861	198,856	99,760	35,606	108,313	62,485	1,513,166
Sept.	1,119,373	629,708	676,732	309,299	230,219	107,987	39,912	107,847	64,663	1,450,723
Oct.	1,233,480	688,837	759,131	340,695	243,462	117,255	45,664	117,089	68,134	1,391,609
Nov.	1,060,735	593,779	649,316	296,674	218,349	104,035	41,655	99,196	52,219	1,309,252
Dec.	1,141,658	619,070	713,332	321,939	247,605	116,410	42,957	95,198	42,566	1,316,308
Total	12,860,437	7,371,700	8,113,242	3,792,562	2,238,309	1,070,252	544,896	1,312,518	651,472	.....
1953										
Jan.	1,161,945	622,392	730,216	324,330	252,181	118,514	38,385	93,930	47,233	1,333,255
Feb.	1,135,868	607,160	721,847	315,101	228,360	106,398	44,420	93,152	48,089	1,332,038
Mar.	1,264,271	674,720	800,390	341,656	250,447	119,630	41,414	114,885	57,135	1,375,886
Apr.	1,277,288	683,047	799,872	329,802	246,873	122,702	44,877	120,105	65,561	1,305,849
May	1,185,545	641,581	734,326	312,836	238,202	115,728	41,373	113,136	58,508	1,271,711
June	1,196,106	648,400	743,737	312,681	232,596	115,946	45,542	114,118	60,113	1,245,904
6 mo.	7,221,023	3,877,300	4,530,388	1,846,406	1,448,659	698,918	256,011	649,326	336,639	.....

Steel Castings—Shipments

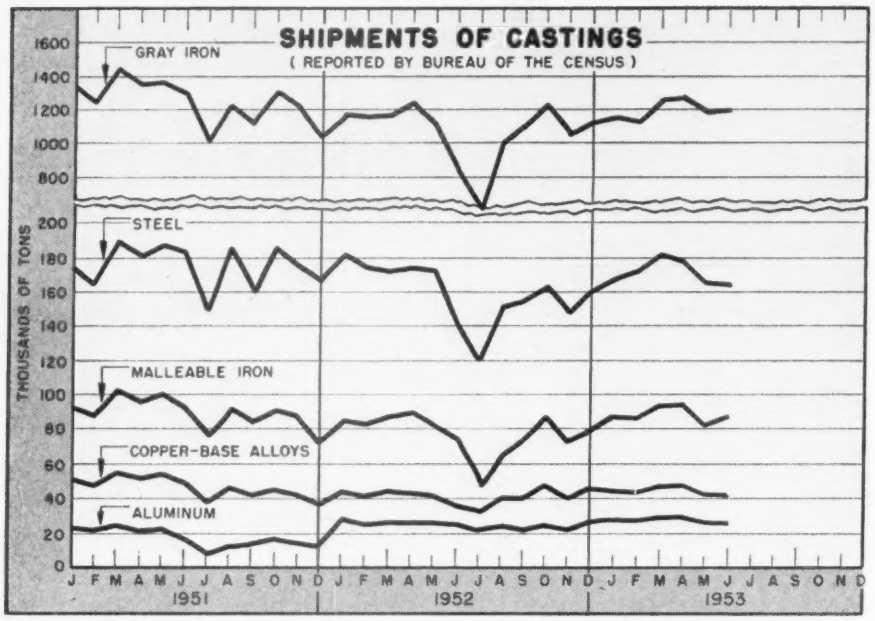
(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties	Unfilled Orders[3]
1951	2,050,054	1,506,903	466,172	1,541,280	1,162,687	415,915	508,574	344,216	50,157	.....
1952										
June	141,628	114,410	30,455	101,850	84,388	26,815	39,778	30,818	3,640	846,459
6 mo.	1,022,396	785,951	200,159	741,033	570,388	175,447	283,353	218,244	24,712	.....
July	119,036	97,633	20,752	81,576	67,600	18,694	37,460	30,329	2,058	855,046
Aug.	150,232	113,997	24,498	107,203	81,123	21,626	43,029	33,359	2,872	809,354
Sept.	158,392	121,402	20,686	109,011	82,968	17,843	49,381	39,190	2,843	781,929
Oct.	165,155	124,626	23,590	116,201	87,035	20,611	48,954	38,571	2,979	772,949
Nov.	148,259	110,467	23,148	105,314	77,979	20,681	42,945	33,349	2,467	751,687
Dec.	161,733	122,166	26,728	114,146	86,165	24,046	47,587	36,757	2,682	719,203
Total	1,925,203	1,476,242	339,561	1,372,494	1,053,264	298,948	552,709	430,429	40,613	.....
1953										
Jan.	167,211	126,819	27,150	118,423	118,423	24,788	48,788	38,121	2,362	706,490
Feb.	175,675	137,592	33,156	122,624	94,991	29,828	53,051	43,495	3,328	644,302
Mar.	182,181	141,873	34,364	129,055	100,069	31,772	53,126	42,286	2,592	634,600
Apr.	179,615	140,051	34,035	128,457	99,602	31,212	51,158	40,938	2,823	573,565
May	165,649	126,380	29,552	117,318	88,781	26,888	48,331	38,036	2,664	196,047
June	164,665	125,984	30,381	116,358	88,260	27,767	48,307	38,130	2,614	475,756
6 mo.	1,034,996	798,699	188,638	732,235	590,126	172,255	302,761	241,006	16,383	.....

[1] Source: Bureau of Census. [2] For sale only. [3] Based on new sampling method: not comparable to prior figures. [4] All cast iron pipe is shipped for sale.

(Concluded on page 162)

FOUNDRY STATISTICS (Concluded from page 161)



Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1952	1953
Jan.	404.5	301.0
Feb.	200.4	257.3
Mar.	310.0	396.2
Apr.	385.1	303.0
May	225.2	294.1
June	353.8	446.5
July	343.9	440.1
Aug.	311.6	...
Sept.	365.9	...
Oct.	335.8	...
Nov.	258.1	...
Dec.	343.3	...

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1951	79,133,744	78,868,124	3,664,404
1952			
July	2,376,019	1,621,308	166,377
7 mo.	36,567,059	34,630,756	1,665,261
Aug.	6,039,749	6,204,539	232,249
Sept.	6,180,804	6,517,682	269,029
Oct.	6,449,519	6,792,273	276,427
Nov.	6,316,660	6,418,639	252,805
Dec.	6,690,649	6,981,036	246,107
Total	68,244,440	67,876,964	2,955,241
1953			
Jan.	6,767,814	6,884,585	248,557
Feb.	6,132,084	6,263,083	237,670
Mar.	6,835,310	6,875,568	275,442
Apr.	6,538,477	6,536,195	272,229
May	6,820,985	6,748,957	274,236
June	6,613,614	6,683,768	254,830
July	6,759,085	6,662,025	218,470
7 mo.	46,467,369	46,659,181	1,781,434

Ingot Brass & Bronze

(Shipments in net tons)

	1952	1953
Jan.	28,315	24,423
Feb.	24,211	25,429
Mar.	23,890	28,256
Apr.	22,547	25,044
May	21,740	21,660
June	21,274	20,818
July	18,947	19,321
Aug.	21,807	.....
Sept.	22,770	.....
Oct.	25,811	.....
Nov.	23,441	.....
Dec.	22,983	.....
Total for year	277,736	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Totals	Shipments—For Sale	Unfilled Orders[2]
1951	478,996	324,961	.....
1952[3]			
June	31,449	21,255	73,290
6 mo.	201,894	138,429	.....
12 mo.	408,353	282,673	.....
1953[3]			
Jan.	45,941	30,702	88,440
Feb.	46,583	31,761	91,800
Mar.	51,673	35,460	90,266
Apr.	51,456	34,674	91,874
May	44,471	29,403	85,234
June	47,799	30,003	88,060
6 mo.	287,923	192,003	.....

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons) Total	Cupola	Air	Electric
1951	70,264.5	3,186.2	3,169.0	55,134.1	8,774.8	63,760	5,731	354	136
1952									
July	981.6	119.7	118.3	712.9	30.7	845	250	12	8
7 mo.	30,496.3	1,471.2	1,496.2	23,902.1	3,591.9	27,516	2,790	170	61
Aug.	5,767.3	262.9	280.6	4,553.8	669.9	5,063	423	9	8
Sept.	6,069.3	294.7	306.6	4,757.0	710.9	5,363	417	21	9
Oct.	6,415.3	280.0	299.4	5,091.6	744.2	5,812	463	24	9
Nov.	6,138.9	262.0	315.4	4,842.6	718.8	5,472	397	21	12
Dec.	6,414.7	293.4	315.1	5,106.9	699.2	5,685	419	24	14
Total	61,306.8	2,864.2	3,013.3	48,254.0	7,174.9	54,911	4,909	269	113
1953									
Jan.	6,470.6	274.9	285.5	5,201.5	708.8	5,784	425	24	12
Feb.	5,802.6	187.0	294.6	3,640.7	680.3	5,027	418	24	14
Mar.	6,601.1	263.9	358.1	5,256.1	723.0	5,873	466	27	14
Apr.	6,161.6	244.7	327.1	4,885.6	704.2	5,568	478	28	12
May	6,508.5	210.0	347.7	5,237.0	713.8	5,843	436	24	14
June	6,288.0	201.6	313.4	5,075.0	698.0	.....	.....	.....	.....
July	6,425.9	213.5	344.4	5,145.1	722.9	.....	.....	.....	.....
7 mo.	44,258.3	1,595.6	2,270.8	35,441.0	4,951.0				

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	All Scrap Purchased	By Types of Furnace: Cupola Total	Cupola Purchased	Air Total	Air Purchased	Electric Total	Electric Purchased
1951	68,518,208	33,822,431	11,090,607	5,878,939	1,203,740	441,099	8,391,919	5,389,093
1952								
May	5,369,258	2,660,471	779,436	401,899	94,597	35,966	700,617	455,480
5 mo.	28,951,721	13,669,279	4,040,851	2,130,001	489,518	183,553	3,567,280	2,268,411
June	2,048,951	1,169,102	719,739	374,127	82,357	30,412	285,596	173,740
July	1,965,007	1,156,296	524,651	278,750	52,999	19,733	364,536	244,944
Aug.	5,470,696	2,738,593	721,255	348,181	74,351	28,091	682,405	446,045
Sept.	5,782,986	2,862,994	760,092	389,910	82,212	30,493	761,795	501,602
Oct.	6,256,031	3,066,041	851,458	439,401	98,947	37,743	814,565	546,189
Nov.	5,960,435	2,885,008	731,825	379,950	80,228	30,502	780,042	518,320
Dec.	6,089,722	2,973,633	804,275	412,177	92,621	35,064	758,845	491,084
Total	61,625,549	30,520,946	9,154,146	4,752,497	1,053,233	395,591	8,015,064	5,190,835
1953								
Jan.	6,256,718	3,061,551	810,254	413,971	95,430	35,695	795,292	517,963
Feb.	5,802,854	2,817,896	818,375	422,306	92,371	35,234	745,179	478,186
Mar.	6,536,867	3,211,476	901,786	464,110	103,034	38,583	857,760	563,189
Apr.	6,227,089	3,026,533	921,589	474,185	106,449	41,004	820,647	531,509
May	6,294,920	3,105,598	861,404	450,477	92,703	35,566	798,098	523,906
5 mo.	31,118,448	15,223,054	4,313,408	2,225,049	489,987	196,082	4,016,976	2,615,053

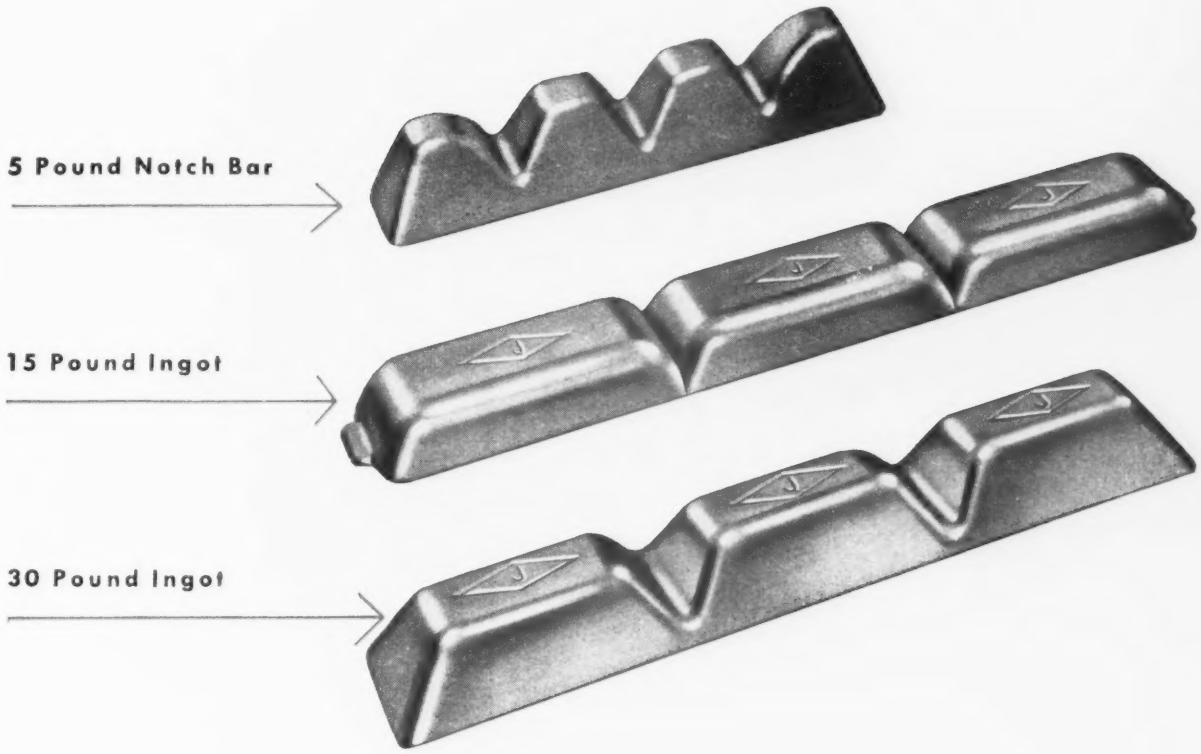
*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. †Source: Bureau of the Census. ‡For sale only. Based on new sampling method; not comparable to prior figures.

DIAMOND J QUALITY

AT NO PREMIUM

IN ALL GRADES OF DIE CAST

ALUMINUM ALLOYS



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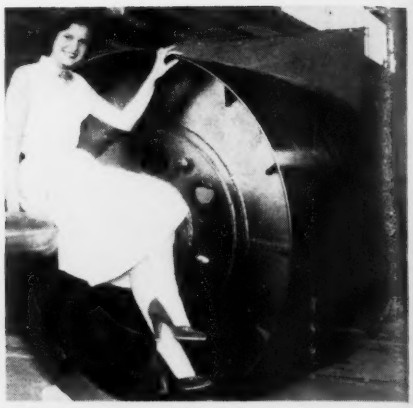
News Views



WORLD'S BIGGEST?: We mean the pulley, not the girl. Said to be largest of its kind in the world, this electromagnetic pulley built by Dings Magnetic Separator Co. has a 60-in. diam and a 46-in. belt width. It will be used in a conveyor system handling large pieces of slag in one of the biggest metal-bearing slag recovery operations in the world

EXPENSES PAID: Initiating a National Radiator Co. program of providing help to boys seeking engineering degrees, President T. B. Focke hands letters to Richard Yasko and Howard Allen, on his right and left, respectively, informing them the company will underwrite their college engineering studies. Both boys plan to enter the University of Pittsburgh in the fall. Others shown include, left to right, Mr. and Mrs. Yasko, Mrs. Allen and Dwight Gove, of the firm's engineering department

SHELL MOLDING: More than 70 foundrymen recently attended a demonstration of a new shell molding machine at the Elizabeth, N. J., plant of Reichhold Chemicals Inc., manufacturer of phenolic resin used in shell molding. The machine was invented by Prof. Frank Shallenberger, department of industrial management, Stanford University, and is manufactured by Shallway Corp., Connellsville, Pa. One unskilled operator is said to be able to produce 60 complete molds per hour with it. The entire operation requires a total floor area of 10 x 10 ft

HANDLES CASTINGS: Use of a Towmotor LT-460 with revolving carriage and a special annealing pot grab to deliver castings 75 ft from cooling floor to shakeout screen hopper saves time and labor for the Eberhard Mfg. Co., Cleveland. Short, quick drops of the pot dislodge castings when pot clamps on the truck mast are released

Photo courtesy of Los Angeles Chamber of Commerce

LOS ANGELES

FOUNDRY MARKET AREA

NUMBER TEN

Although the majority of its foundries are in the small to medium size class, the Los Angeles foundry market area, nevertheless, can boast of the greatest number of foundries in the nation—322. Annual capacity is a very respectable 750,000 tons and total employment slightly over 12,000. There are many jobbing foundries turning out castings in aluminum, with brass and gray iron close up in importance. And many of the Los Angeles iron foundries use ANNEALSHOT and or SUPER-ANNEALSHOT because they obtain exceptional efficiency and economy by using these top quality abrasives. Phone your Metal Blast representative—or write direct to METAL BLAST, Inc., 872 East 67th St., Cleveland 3, Ohio.

Statistics from Penton's HOW TO SELL THE FOUNDRY MARKET

ANNEALSHOT
chilled shot and grit
SUPER-ANNEALSHOT
malleable shot and grit

Man-to-Man

By RALPH L. LEE

Doodling in the Foundry

"There never was a time in the history of the foundry industry when we had so many materials, processes and tools to pick from"

IT'S getting so now that when I sit down to a sketch pad or a drawing board to work out one of my goldbergs, I automatically take into account the *shoulds*, the *shouldn'ts*, *cans* and *can'ts* of foundry practice. While I have a long way to go as far as experience is concerned, I feel quite happy about this foundry complex of mine and my urge to figure out some way to make the old foundry bug bite engineering students, apprentice draftsmen and designers and inoculate them with the cast metal virus.

I suppose there is always a danger of overdoing even the best of things. Mother, (that's Mrs. Lee, my home superintendent and vice president in charge) frequently gangs up with my son to accuse me of going around Robin Hood's barn to cook up an excuse for making a casting, even when sheet metal would have been better. Be that as it may, I'm quite sure that we have a long way to go before designers of metal products reach a point of fanaticism regarding the use of castings that will cause suffering to industry.

Of course, the first major problem in designing anything is to get something that will work at all. This is usually such a tough nut to crack that choosing the best material and the best way to make the product is lost in the shuffle at the early stages of the game. This wouldn't be so bad if it weren't for the fact that, in case after case in my recollection, folks with the say-so have been so delighted with a working model that, so to speak, they locked the form, pulled off all the tinkerers and put it into production with uncastable castings, destined to pile up tons of needless scrap, down through the years, and to cause unnecessary machining trouble, production delays and money flowing down the drain or the foundry rathole.

So it seems to me that to avoid messes like this, it isn't quite enough for a designer to be able to recall, when he sets his mind to it, the way castings can and should be made and where they should and shouldn't be used. He's got to know most of these things so well that he uses them as instinctively as he uses his knowledge of walking or talking. I guess it's the degree of knowing a thing that we're talking about.

But even with the best designer, there should come a time, after all of the operating bugs have been out, before the form is locked, when every responsible person in the place can gather around the apparatus and toss in his two bits worth as to how he thinks the job should be done. And by the way, although I've been talking as though I were only a designer, not the president of the Lee Hobby Foundry, it occurs to me that our subject applies just as much to the foundry as it does to the manufacture of finished products.

A short while back I made a single pattern for a shelf bracket that's intended to hold a clock, a few books or bric-a-brac—we've got one at the top of the cellar stairs for things that should be taken down the next time we go. The vice president got all hopped up about these brackets, finding new places for them and folks to give them to; so I found myself with a production problem.

Needless to say, the pattern was flat. That feature didn't just happen, either. I'll just bet there are a lot of castings that could just as well have been made with flat patterns if the designer had known his onions. Facing my little production problem, I had a lot of fun thinking of all the ways I had to choose from.

Right off the bat it occurred to me that I could send my so-called master pattern to a friend of mine in Cleveland who makes these pressure cast plates in plaster. He's been after me to do this. But with an unknown production, small at its best, I knew that this would be downright silly. Besides, it would have deprived me of some tinker fun.

Then I thought of making three nice, clean, aluminum castings and mounting them with the master on a board; three of them, of course, would have double shrink.

One persistent idea kept pestering me. I could take my little peewee expanding flask and do them one at a time, but shucks that would spoil the fun of wrestling with a production problem, even though it might be the most economical method.

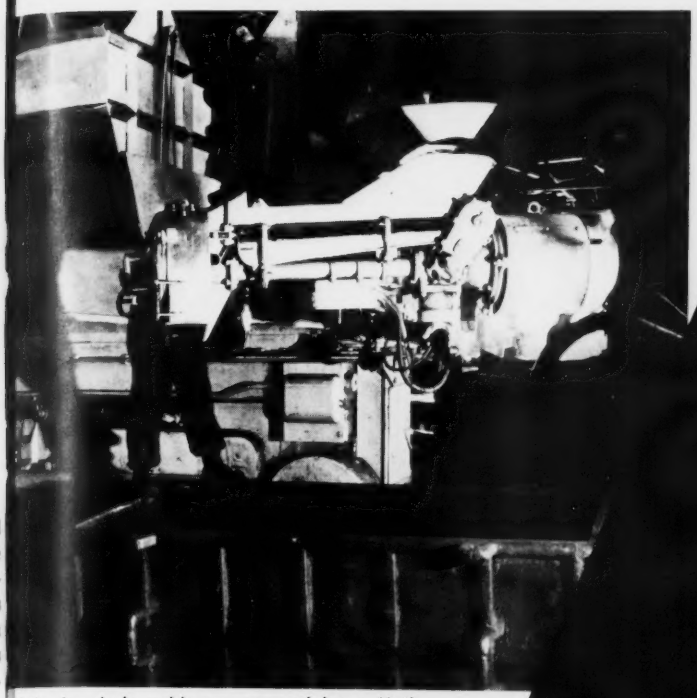
I thought of fluffed-up plaster for duplicating my master, also of expan-plaster. A plate of that hard cement plaster poured into a sand mold reared its head, but my little molding machine blows right through them.

Then I remembered some fun I had some time ago with plaster impregnated with plastic. I read about this stuff in FOUNDRY, and I sent away for some. It's very interesting—I'm going to get into this further, later on.

Straight plastics came to mind, although I've never had any experience with them. I've talked to some folks who are all steamed up on the material. Wax duplicates for patterns, like those of my hardware friends in New York, wouldn't do in this case, nor would shell molding (just imagine, with my small and spotty production!) I passed lightly over lost wax, permanent molds and die castings. But what a cafeteria counter of stuff I had to pick from, with more coming all the time!

Finally I remembered one of those rare and few remaining master molders, a fellow I visited with at the Singer Sewing Machine foundry in New Jersey. I liked him so well that I went back several times. He

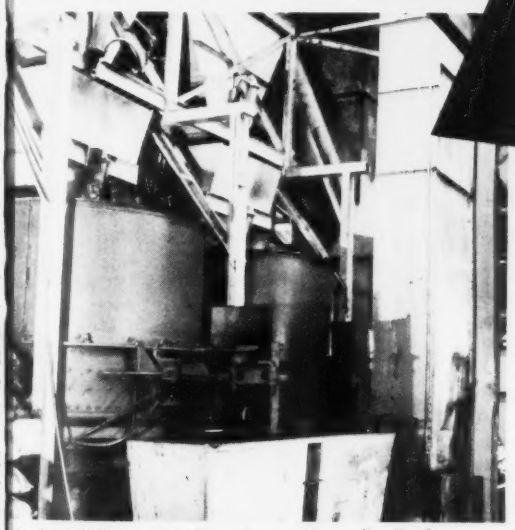
(*Concluded on page* 169)



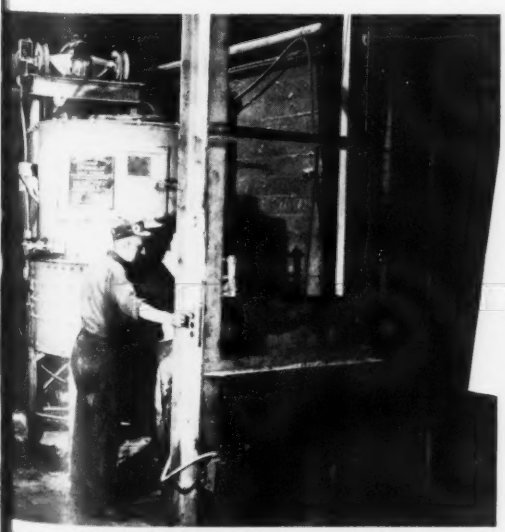
of the foundry's molds are rammed by a Motive dslinger. Surface quality and true-to-pattern ac- cy are essential for Wisconsin Grey Iron's castings.

3 TIMES CAPACITY

with SPEEDMULLORS and a SLINGER at Wisconsin Grey Iron Foundry



Model "70" Speedmullors thoroughly mull all of consin Grey Iron's molding sand. Speedmullor Mull- atic precisely controls the mulling cycle—90 sec- is required for a total cycle.



Model "40" Speedmullor replaced a conventional in mulling all of Wisconsin Grey Iron's core sand. ime and delays while waiting for core sand have eliminated.

Now with the installation of a Motive Sandslinger to ram all molds, two Model "70" Speedmullors to prepare all molding sand and a Model "40" Speedmullor for core sand, the Wisconsin Grey Iron Foundry has tripled their capacity from 25 tons to over 80 tons of castings per day. Costs have been considerably reduced too in this capacity boosting foundry mechanization.

The whole story is featured in July-August Better Methods—a copy is yours for the asking. The story tells in detail how Wisconsin Grey Iron replaced conventional mixers with Speedmullors enabling them to switch to synthetic sand and to mull all sand in the foundry. The story tells of the results obtained with fully mulled Speedmullor sand and Sandslinger ramming. Wisconsin Grey Iron is another one of hundreds of foundries producing top quality castings with Beardsley & Piper equipment.

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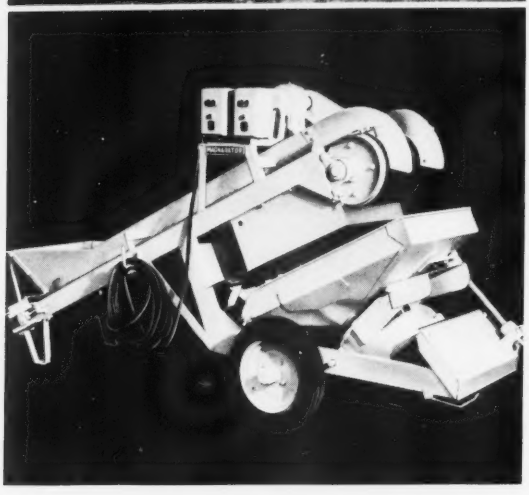

The Magnarator

- Screening and aeration
- Directed discharge

plus

- Capacity of 30 tons per hour
- Magnetic separation
- One man portability

Check the combination of features you need in a floor sand conditioner

Check *all* of the features you need and then choose from the only complete line of floor sand conditioning machines. The 1953 Beardsley & Piper line with four star performers: the Screenarator, the Magnarator, the Jr. Nite Gang, and the Nite Gang.

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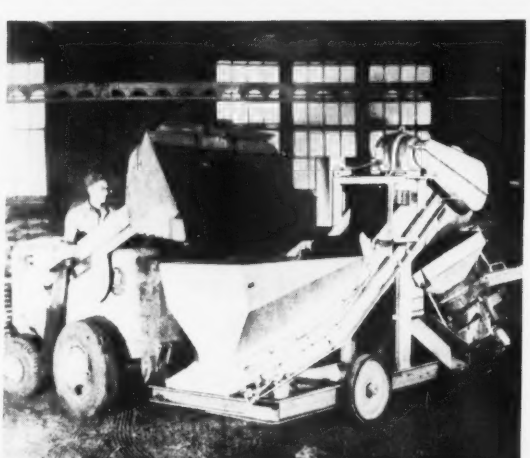
For information on complete low-cost floor sand conditioning to fit any budget, write today to *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago 39, Illinois.*

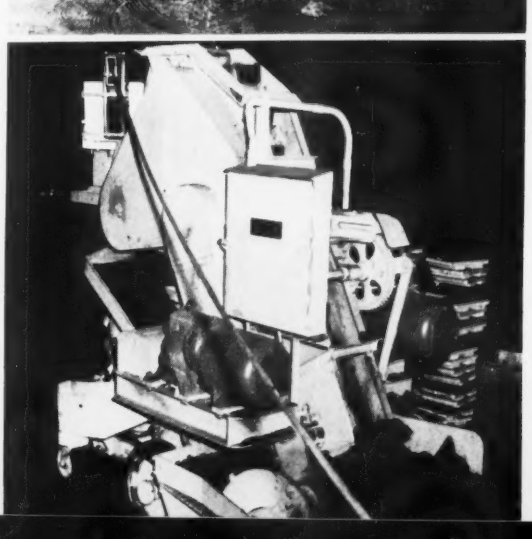


The Jr. Nite Gang

- Screening and aeration
- Directed discharge

plus

- Capacity of 40 tons per hour
- Magnetic separation
- Hopper loading from a front-end loader



The Nite Gang

- Screening and aeration
- Directed discharge

plus

- Capacity of 50 tons per hour
- Magnetic separation
- Self-loading
- Self-propelling
- Automatic cable reel
- Hydraulic elevator tilt

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

MEMBER FEMA

(*Concluded from page* 166)

showed me how to make a mold for a multiple impression-plate pattern from a single master in one flask. He didn't rush around at his work—in fact I have never seen a man accomplish so much with such ease and with so few moves. In spite of this, so many interesting new things came to me so fast as I watched him, that I couldn't grasp all of them. Making notes was partly responsible.

Well, anyway, I've been haunted by his method ever since my last visit, some five or six years ago. I had no trouble remembering this part of it: After he had made the molds from his pattern, he placed over his cope an iron fence with the thickness of the plate-to-be. Inside this fence he very carefully laid the pattern of the plate-to-be. Then with great skill and again with that easy, effortless speed of his, he rammed ("rammed" is a bit too rough for what he did) sand between the outer fence and the inner plate and slicked it up.

After drawing the pattern for the plate, he set the cope down on the outer frame, clamped the flask and poured this interesting sandwich. The casting shook out cleaner than a whistle, and he told me while we looked at it that very little metal pattern work would have to be done on it. Boy! that was slick.

But in spite of my notes and the close attention I tried to pay, I could not remember to save my life how he made the two cope and drag molds from a single pattern. Now that I think of it, he could have done it behind my back.

I decided to take off my shelf bracket production problem as an excuse for making several molds in the same flask by hook or crook, and I certainly had a lot of fun trying to do it. I'll admit I went a bit hog wild baking single green sand molds, whittling them down to size and trying to paste them together. I even whipped up a core sand mixture. But the pieces were too fragile to mess around with, the effort was a botch from every angle, and, besides, I felt silly.

Well, I finally made two molds from one pattern in the same flask and now that I have done it and feel sure that I can do it again even with patterns that aren't flat, I wonder what all the fuss was about. I rammed up a flat cope, then put a removable partition in the drag half of the flask, bracing it against the inside. I set the pattern on the rammed-up cope, put parting on it and rammed up half of the drag. Then I rolled the flask over, lifted the cope, drew my pattern, replaced the cope and rolled the flask over again. Then I lifted the cope and was happy that I hadn't crushed my mold. (This could get monotonous, couldn't it?)

After removing the partition in the drag, I repeated the whole process for the second impression, but the big point is that I ended up with two exceptionally good patterns gated to a runner, both made in one flask from one master. Just to show myself what I could do if properly inspired, I made four molds in one flask from one pattern, but found I had to be pretty darned careful if I tried to put the cavities too close together.

I don't know to what extent foundrymen all over are familiar with this stunt—it wouldn't surprise me that it's an old story to quite a few, although I don't see much of it going on around the country during my visits. But it doesn't make much difference anyway. What we started out to talk about was charging our batteries with the *cans, can'ts, do's, don'ts, should* and *shouldn'ts* of cast metal principles and methods when we start out to design something, whether it be a vacuum cleaner, typewriter, engine or drink mixer. And it's of just as much importance to us foundrymen to have our batteries charged when we design our equipment and choose procedures for making castings as they should and can be made.

I imagine that we can all agree there never was a time in the history of this grand old foundry business when we had so many materials, processes and tools to pick from while planning to give our customers the best. This suggests that we have to keep our eyes and minds open to what's going on in the industry.

Book Review

Manual on Industrial Water, cloth, 336 pages, 6 x 9 in., published by American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $4.25.

Intended as a reference source of information for executives and plant designers; individuals engaged in industrial operations involving use of water; and analysts, operators of special instruments, engineers and consultants, this book provides basic information for routine use and gives direction into the technical literature and serves as a point of departure for more specific and detailed studies. Book contains five ASTM methods of testing water.

OVENS FOR THE FOUNDRY by DRY-SYS

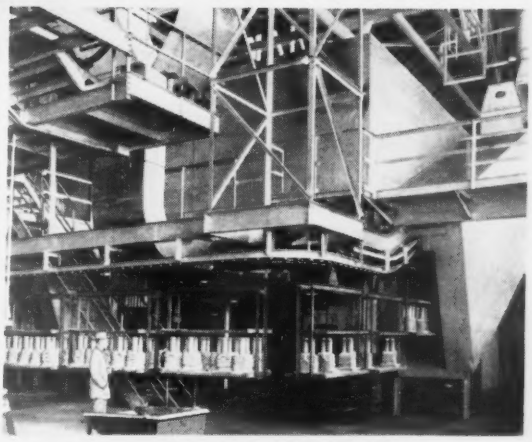
There are 11 like this at the CLEVELAND FORD PLANT!

We feel confident you will agree that keeping this kind of company speaks pretty well for Dry-Sys Ovens. Boastful perhaps, but 11 such ovens certainly should confirm the high standard of experience, engineering and painstaking development in back of the Dry-Sys name plate.

And, don't believe for a minute that this only applies to large ovens and multiple oven installations, because you will find the same skilled workmanship and efficiency of operation in all small Dry-Sys Ovens, Box or Conveyor Type, for the small foundry.

In fact, every Dry-Sys Oven is individually designed for your specific needs and includes the finest in automatic temperature control, and full automatic safety protection—efficient air circulation to all parts of the load — and sturdy construction for long hard usage.

When you buy a Dry-Sys Oven —you buy a complete, guaranteed production unit installed in your plant.



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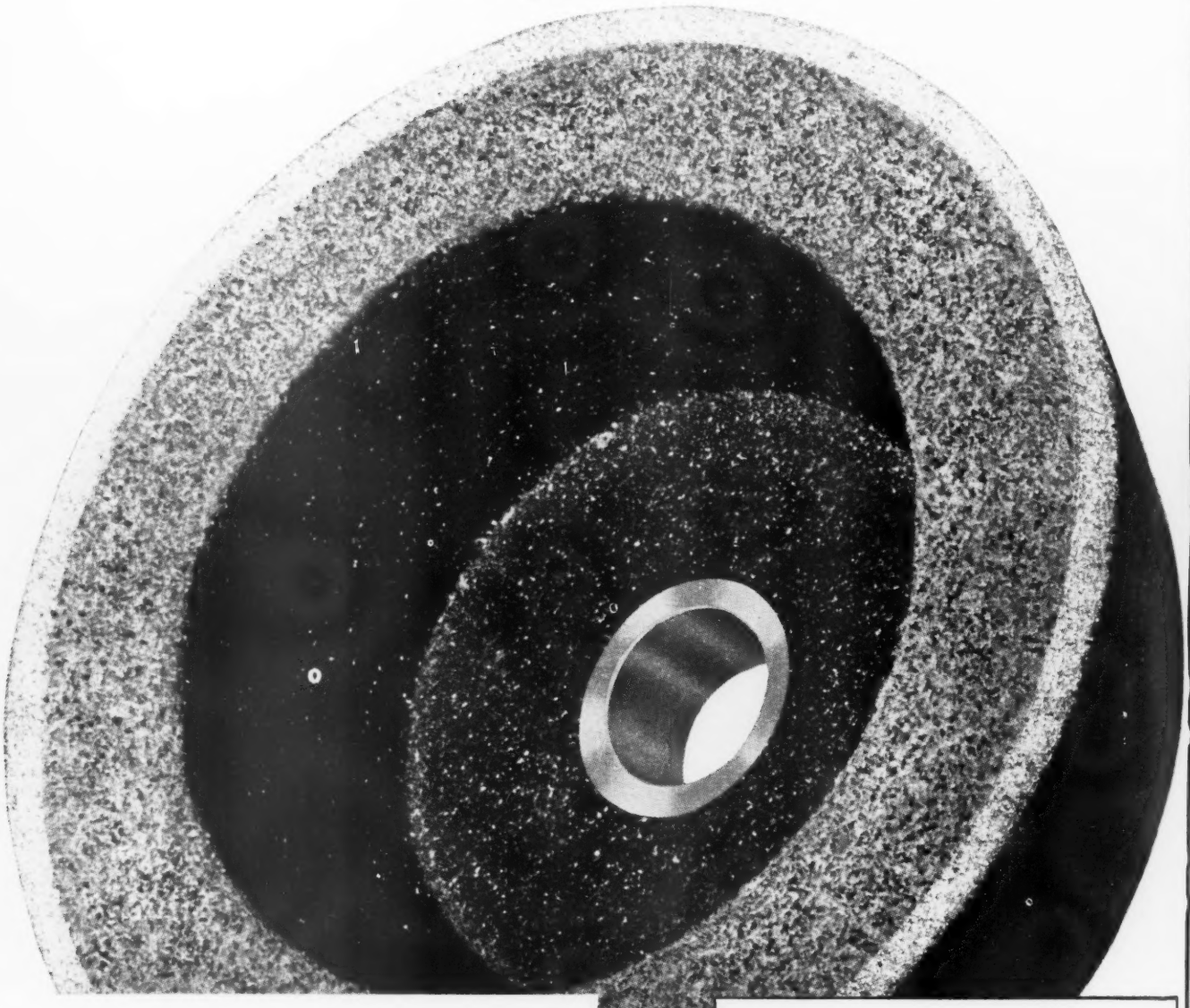

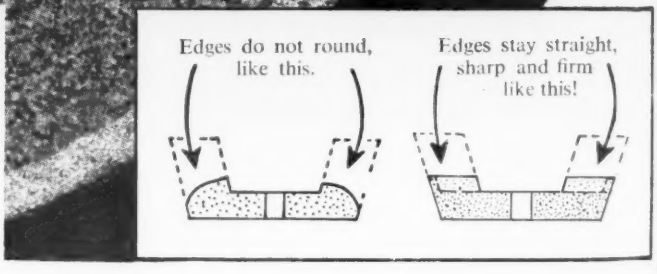

You buy a flaring cup wheel for edge grinding, to reach into and clean up corners. But how often do you find that although the wheel can *start* the job, its edge rounds off into uselessness, long before the job is finished?

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Foundry Developments

By EDWIN BREMER

RECENT development of National Research Corp., Cambridge, Mass., is production of pure and alloy-titanium castings of complex shape and weighing up to several pounds. Process involves vacuum melting furnaces, casting procedures, and mold materials capable of withstanding attack by molten titanium. It is said that the carbon, oxygen and nitrogen content of the

castings are reasonably comparable with commercial wrought titanium, and surface is equal to good sand-cast metals, ferrous or nonferrous, molded in the usual manner.

* * *

REPORTING on "The Apparent Thermal Conductivities of Molding Materials at High Temperatures" in the July issue of the *Journal* of the Iron and Steel Institute (London), D. V. Atterton states that the apparent thermal conductivities of compacts of bentonite-bonded silica sands are of similar values (about 0.002-cgs units) at room temperatures, where the mechanism of heat transfer is virtually only by true thermal conduction. Increase of temperature up to about 600° C causes a decrease in apparent thermal conductivity, owing to a decrease in the thermal conductivity of silica. Between 600 and 1300° C the conductivity increases with the cube of the absolute temperature because of the onset and eventual predominance of heat transfer by intergranular and transgranular radiation.

Beyond about 1300° C the apparent thermal conductivity values are less than those predicted by the cubic equation; this probably is due mainly to reduction in the heat transferred by transgranular radiation consequent upon chemical reaction and sintering in the sand. Increase in compact density and of binder content of bentonite-bonded silica sands increases the apparent thermal conductivity, particularly at low temperatures, and this probably is due mainly to an increase in the area of contact between the grains for true thermal conduction.

* * *

NEW publication available from Government Printing Office, Washington 25, is *Electrodeposition Research*. It contains the proceedings of a symposium on the subject held at the National Bureau of Standards in 1951 and represents a cross section of the research currently being conducted in electrodeposition by industrial, university, and government laboratories in Europe and the United States. Publication is National Bureau of Standards Circular 529 containing 129 pages. Price is $1.50.

* * *

INDICATION of a sulphated condition in an electric storage battery, according to Gould-National Batteries Inc., is low specific gravity and voltage readings on all the cells. Internal examination after a normal charge will show the negative plates have a slate-like feeling; the sulphated material is hard and gritty with a sandy feeling when rubbed between thumb and forefinger. Normal fully-charged negative plate is spongy and springy to the touch and gives a metallic sheen when stroked with the fingernail or knife. A sulphated positive plate is a lighter brown color than the normal plate. Most cases of sulphation are due to undercharging; partial charging or neglect of equalizing charge; permitting battery to stand in partially or completely discharged condition; low electrolyte; high specific gravity, and high temperature.

* * *

BERYLLIUM addition in the amount of 0.004 per cent to the 90-10 aluminum-magnesium alloy is quite effective in inhibiting the metal-mold reaction, according to an extensive review of the subject in a paper by Marjorie Whitaker presented at the recent annual meeting of the Institute of British Foundrymen. Addition of beryllium alone serves in castings of thin section of up to 1 in. in diam or about ½-in. plate thickness. For thicker sections boric acid or ammonium bifluoride also must be added to the sand, and effectiveness is carried up to sections 4 in. in diam or 2-in. plate thickness. Contamination with sodium as well as sulphur must be avoided.

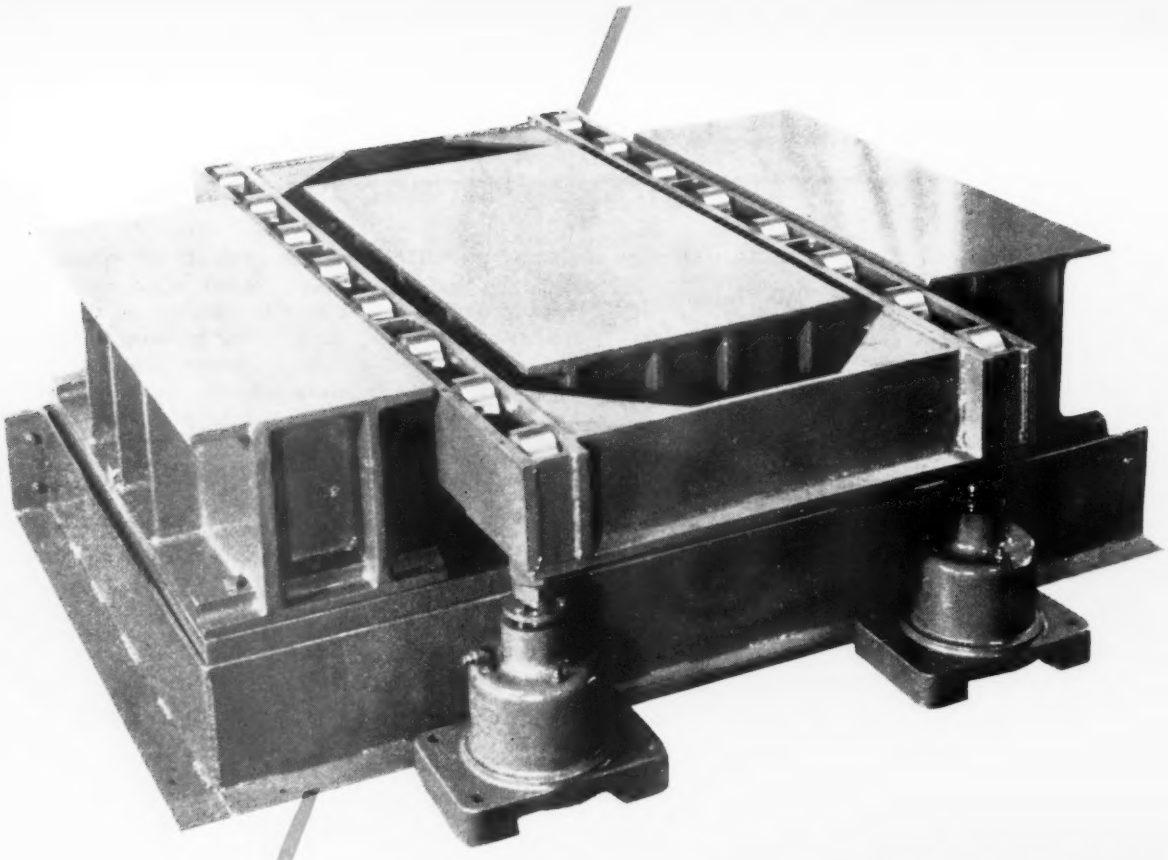
* * *

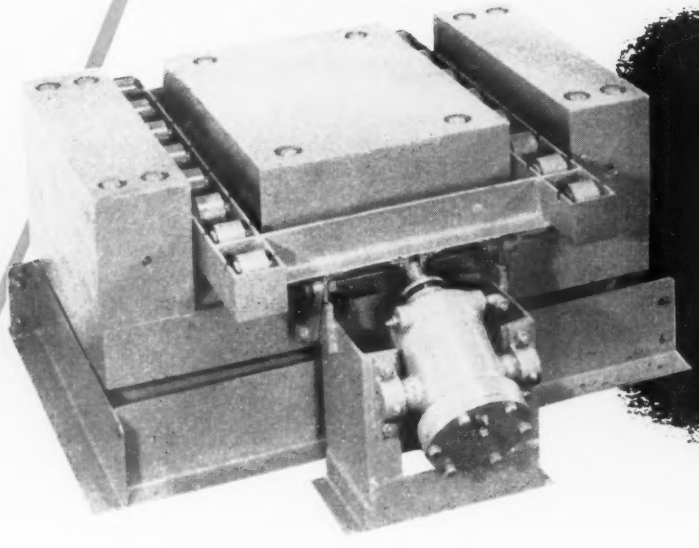
STUDY of the electrical resistivity of cast iron by K. B. Palmer, and published in the June issue of the *Journal of Research and Development* of the British Cast Iron Research Association, led to the following conclusions: C and Si have by far the greatest influence on the electrical resistivity of cast iron. The lower the C and Si, the lower will be resistivity of iron, and as those elements are increased the resistivity increases. When C is present as graphite, coarse flake structures give highest resistivity with a lowering of that property as the flakes become finer. Nodular graphite structures give the lowest resistivity of all.

Mn and S do not affect resistivity of ordinary gray irons which usually have S balanced by Mn. With P up to 0.2 per cent effect on resistivity is almost negligible, but above that value P has an effect on graphite structure which produces an increase in resistivity. Of the alloying elements Ni and Al are the only ones which have any appreciable effect, both raising resistivity with increasing additions. Cu, Mo, Cr and V have little effect beyond a slight tendency to lower it.

* * *

NOISE is becoming one of industry's major headaches. To do something about it you must know how much noise your plant is generating as well as other factors. Data on checking this information are available in a series of standards for sound measurement published by the American Standards Association Inc., 70 East 45th St., New York 17. They describe how to measure noise, how to calibrate test equipment, what kind of meters and other equipment to use and how to use them, what kind of equipment to use in diagnosing and screening the hard of hearing and how to use it, and how to determine the characteristic of hearing aids.





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The Charging Conveyer Type Jolt Machine is designed for use as a single unit or in conjunction with a Herman Charging Conveyer Type Rollover and Draw Machine or regular Rollover and Draw Machine.

It's available in a wide range of sizes and capacities, and it's adaptable to the production of either molds or cores.

Flasks or core boxes can be filled directly on the machine or at a separate filling station. A power lift conveyer lowers the pattern and flask onto the stool atop the table plate for the jarring operation; then, upon completion of the operation, elevates the rammed mold to a standard conveyer line height.

This efficient, economical jolt unit is another in the complete line of HERMAN Molding Machines, in all types and sizes, to fit all foundry operations.

Write us for more information.

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FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

Around the Country

NEWS REPORTS FROM

Chicago
Los Angeles
Philadelphia
New York

Chicago

OUTPUT of merchant pig iron in the Chicago district received a substantial boost Sept. 1 when Interlake Iron Corp. lighted its rebuilt and enlarged blast furnace "A" at its two-furnace plant in South Chicago.

This stack was blown out Apr. 2 at which time its rated capacity was 525 tons a day. It now has a potential of 850 tons daily. The company spent $6.4 million in its rehabilitation program. The stack makes merchant iron exclusively.

Since foundries have found iron supply comfortable for the past two or three months, it will be interesting to see what effect the bigger supply will have on the market and on future blast furnace operations here.

News dispatches from Brussels, Belgium, in late August told of the recovery of $99,000 of $250,000 worth of American and British banknotes lost when the *Flying Enterprise* went down Jan. 10, 1952, off the coast of England 13 days after her deck split in an Atlantic hurricane. It was this disaster that made Capt. Kurt Carlsen a hero.

It was stated in the dispatches that the Italian salvage ship engaged in retrieving the money also hoped to bring up 500 tons of pig iron from the sunken wreck. This recalls a report that was current soon after the ship went down—namely, that the iron was consigned to Perfect Circle Co., Hagerstown, Ind. A considerable amount of foreign pig iron was coming into the United States at that time to ease the shortage of domestic iron brought on by the rearmament program.

New York

WHILE iron casting buyers are keeping inventories low, there is a mild broadening of activity which is proving encouraging to district gray iron shops. Virtually all operators see better business ahead now that the summer season is over. Most shops are operating five days a week and have modest backlogs of possibly three weeks or so on an average.

Inventory consciousness is ascribed primarily to opinion among buyers that they can get castings without undue delay and also perhaps to the feeling that money is a little tighter.

Steel foundries are operating at a good clip, although backlogs continue to drop because of the lag in defense work requiring steel castings. Malleable shops are doing fairly well. Brass and bronze foundries are moderately active, with captive shops lifting the general average—excepting for those catering to the maritime field. Light metal shops are busy.

Raw material supplies are generally adequate, especially such tonnage items as pig iron and scrap.

Philadelphia

GRAY IRON foundrymen see a somewhat more active period ahead now that the summer vacation and hot weather season is over. They anticipate a full five-days-weekly operation and at least enough new work to sustain a three-weeks' backlog. Actually they wound up the summer with such a backlog, but this was due in part to somewhat spotty operations resulting from extremely hot weather and a certain amount of last-minute time off for vacations.

Expectation is that business improvement will be rather general with no particular gains in any one or more lines. While machine tool building is said to be active for the industry as a whole, this district is sort of an "overflow area" and there is not enough activity in this important field to have any special bearing on business here. Also, the pipe season is getting somewhat advanced; hence no spurt is expected, although good volume is anticipated for a while. It is the ordinary run of miscellaneous work that is expected to lift the average as the fall season gets under way.

Backlogs in steel castings are likely to taper further. This prospect is based on a further shrinkage in defense work, which for a long time after the outbreak of the Korean war literally dominated steel casting production, extending backlogs months ahead. Today, most steel foundries can promise deliveries within five to six weeks on the general run of work.

Malleable operations are on fairly even keel, with production at around 80 per cent and backlogs averaging approximately four weeks. Agricultural equipment needs are off seasonally, and truck requirements are down. However, pipe and fittings are reasonably active and there is a definite pickup in railroad requirements, with miscellaneous needs sustained.

While little defense work is in prospect, bronze and brass shop operators see a good level of business over the next several weeks, at least. The major weak spot appears to be in marine hardware. Aluminum and magnesium shops are still overflowing with work, due primarily to aircraft and other defense work.

Los Angeles

AFL contracts just signed by nine local gray iron foundries adds 13.5 cents across the board to pay rates for all labor grades. This brings to 20½ cents the total increases granted this year by gray iron foundries. Other shops holding contracts with CIO are expected to come to agreement shortly. Pay rates of local gray iron foundries are now about the same as in San Francisco but about 15-18 cents lower than in Seattle.

Trade observers are speculating whether foundries will hike casting prices to account for higher labor costs, and what the consumer reaction will be if the increase comes. Most foundries advanced prices of castings by 9 per cent in February with hardly a ripple of customer reaction. Currently, however, foundrymen are taking a long look at the situation. Most observers think an increase in the price of castings would result in a flurry of objections from customers—but eventual acceptance.

Ferrous foundry activity is affected by seasonal lulls but is 10-15 per cent higher than last year at this time. Currently 3-4 weeks, sales backlogs are lengthening. In the first

(*Concluded on page* 176)

the

Mathews Engineer brings you 47 years of experience in mechanized handling

In the highly-specialized field of modern conveyer system work, there is no substitute for experience. In Mathews equipment you get that experience, plus the engineering resources and production facilities of three modern plants. That's why we believe you get more for your money—better design—better performance—longer service—when you buy Mathews Foundry Conveyers. *Write today for Catalog 151.*

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(*Concluded from page* 174)

quarter backlogs were 4-6 weeks; in second quarter, 1-2 weeks. The last quarter of 1953 is expected to bring backlogs back to first quarter levels.

Activity of aluminum and brass foundries is described by some as "mediocre." The melt has fallen 20 per cent in the last three months. Aluminum smelters are adjusting operating rates to the lower plane of foundry activity, but the first 6 months of smelters' sales were 5 per cent ahead of last years'. Aluminum and brass foundry operators are slightly pessimistic, but if sales hold to current levels for the remainder of the year they'll be satisfied, they say.

GIFS Publishes Last Cost Manual Preprint

Gray Iron Founders' Society, 210 National City-East Sixth Bldg., Cleveland 14, has published the fourth and last in the current series of preprints for subsequent inclusion in the forthcoming Cost Manual No. 2. Entitled "Advanced Cost Methods for Gray Iron Foundries," the material included applies to the cleaning and shipping departments. A limited number of extra copies are available to member companies.

"Lighting for Foundries," prepared by the Subcommittee on Lighting for Foundries of the Lighting Study Projects in Industry Committee, Illuminating Engineering Society, also is being distributed by Gray Iron Founders' Society.

Book Review

Materials Handling Equipment and Methods in the U. S. A., Technical Assistance Mission No. 42, Paper, 170 pages, 6 x 9½ in., published by the Organization for European Economic Co-operation, Paris. Price 9 shillings or 450 French francs.

This work consists of a report by a mission of European experts on the nature, production and use of materials handling equipment in the U. S. A. It outlines typical handling devices, considers them in terms of their manufacture and use, gives a number of practical examples of efficient handling noted by members of the mission and appends a list of films and American publications on the subject.

Primary aim of the volume is to expand mechanical handling in Europe and to increase productivity accordingly, but Americans will probably find much of interest in the report also since it deals with recent developments in the field in America.

Film Shows Automation at Ford Cleveland Plant

Cleveland and many of its citizens appear prominently in a new motion picture, "Technique for Tomorrow," that has been produced by the Ford Motor Co., Dearborn, Mich.

The film tells of the development of a new way of industrial life for American factory workers through the use of automatic machinery. This process, known as automation, is now in full operation at the Ford Co.'s engine plant and foundry in Cleveland.

During its 24-minute running time, the film shows the tremendous changes that have been brought about by the introduction of automatic manufacturing techniques in the daily working lives of the 5700 citizens of Greater Cleveland who work in these plants. Many of the persons in the film had no idea they were being photographed during the two-month period Ford motion picture crews were creating the documentary film at the plant.

Approximately 50 copies of the film have been made available for showings in Greater Cleveland, and the film also will be distributed throughout the United States by Ford film libraries.

"We'll have to get one for this side, too, if we expect to get any work done!"

Alcoa's Cleveland Plant Includes Research Foundry

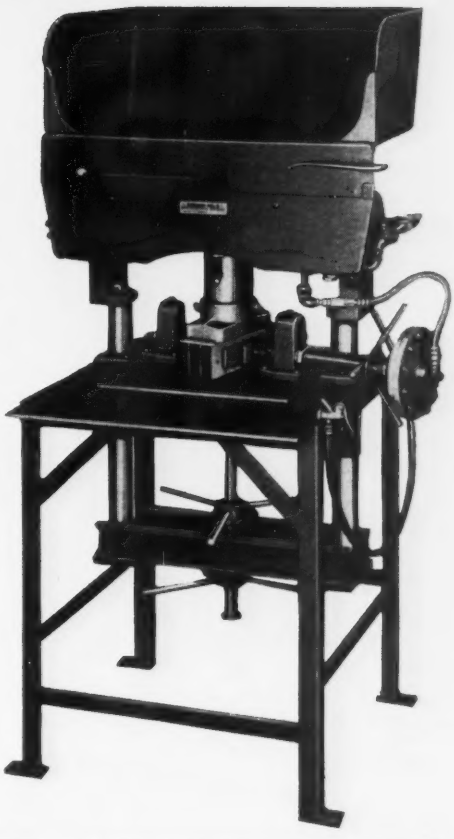
Cleveland Research Division of Aluminum Co. of America's Aluminum Research Laboratories is made up of ten laboratory units including a research foundry for producing castings and test bars for development of new alloys, processes and casting designs and to study gating and pouring techniques; a radiographic unit for developing casting techniques; a sand analysis laboratory for improvement of core and mold materials, and a plaster casting laboratory for investigating techniques and materials for producing intricate castings with close dimensional tolerances and smooth surfaces.

Casts Huge Propeller

Bethlehem Steel Co.'s Staten Island yard is giving the finishing touches to a five-bladed propeller which is said to be the largest ever made for a cargo ship. It weighed 87,000 lb as a rough casting, will be finished to 70,000 lb, is 22½ ft in diam and will be used to drive the largest tanker ever built in an American yard.

Redford CORE BLOWERS

Assure MAXIMUM Production With MINIMUM Effort



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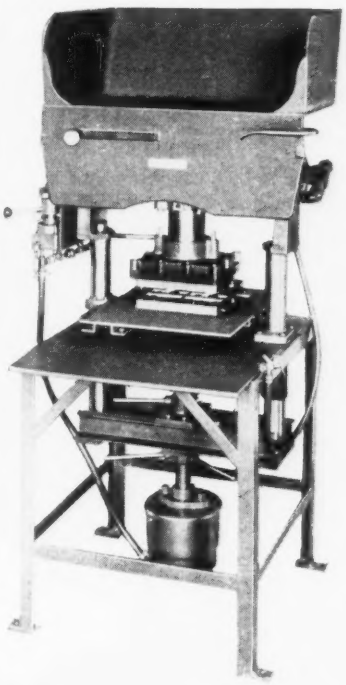
8 OUTSTANDING FEATURES:

1. Large stationary work area.
2. Large sand supply hopper.
3. Stationary sand magazine.
4. Easy accurate locating of core boxes.
5. Quick change magazine heads.
6. Quick adjustment for different height core boxes.
7. Quick change, fully adjustable, vertical clamping attachment.
8. Actuating one handle clamps the core box, blows the core and releases the core box, in two seconds.

CAPACITY: Cores up to 5#

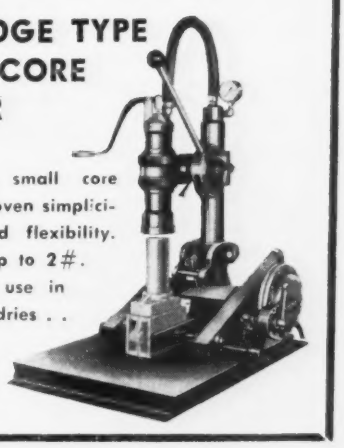
Write for Specification Bulletin "F"

THE No. 2-D CORE BLOWER



A fast and accurate DRAW TYPE core blower for small work—has stationary sand magazine and many additional features assuring maximum production. Quickly adjusted to accommodate core boxes not requiring the draw feature. Can be equipped with clamping attachment for vertically split core boxes.

THE CARTRIDGE TYPE BENCH CORE BLOWER



The original small core blower . . . Proven simplicity, speed and flexibility. Makes cores up to 2#. Thousands in use in American Foundries . .

Write for Specification Bulletin "G"

SIX FEATURES:

1. MAXIMUM SAFETY—Operator must use both hands at once to clamp core box and blow cores.
2. ACCURATE DRAW—Stationary sand magazine and long lead on draw table shaft assure accurate draw.
3. ADJUSTABLE LENGTH OF DRAW—Quickly changed without changing height of table.
4. FLEXIBILITY—Easy adjustments permit use of draw feature even on short run jobs. Draw type magazine heads having removable blow plates are interchangeable with regular No. 2 magazine heads.
5. CORE BOX VIBRATION—Controlled by keeping draw valve handle depressed during draw operation.
6. PROVEN—The No. 2-D is being used in leading foundries everywhere. Backed by the Redford reputation for quality equipment.

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★ ★ ★ These superior PATTERNS are produced under the personal supervision of the two owners and a highly skilled group of employees.

★ ★ ★ The owners are naturally proud of their reputations. That's your guarantee of quality work and reasonable prices. Let them give you a quotation on your next job—and give you a pleasant surprise.

AUTOMOTIVE PATTERN Company

Wood and Metal Patterns

18840 John R. St., Detroit, Michigan

For Top Quality Castings—

SAND
Portage (Wis.) Silica
Century Molding
*Ottawa Blackhawk Silica
Muskegon Lakesand
Tenn. & Ind. Molding
Utica Crude Silica
Silko Molding
*Zircon Sand, Flour and Wash
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*Volclay, MX-80 (Granular)
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GIFS Marks 25th Year

(*Continued from page* 127)

that gray iron was indispensable to the production of war materials and equipment. This metal provided components for hundreds of important manufactured items needed to carry on the war.

In peacetime too, it would be difficult to name a product or a service essential to our economy which does not use this metal. Gray iron castings facilitate production of food, clothing and most of the luxuries we enjoy. Gray iron is pistons, shafts, diesels, and motor blocks. It is machine frames and moving parts, caustic pots, cooking utensils and glass molds. It is dies, housings, brake mechanisms, furnaces, manhole covers, marine hardware, mail boxes, valves and bearings. You can find this ubiquitous metal in locomotives, appliances, typewriters—in just about every phase of modern life in this machine age.

Expand Usefulness of Gray Iron

Although the 19th century brought with it many foundry improvements, such as the first molding machine, first jolt machine and the drop-bottom cupola, it was not until the 20th century that modern metallurgy was applied to expand the usefulness of the unique and valuable characteristics of gray iron castings. In the last decade, progress has been exceptionally rapid, and today this vast industry provides a ready supply of quality castings in practically every industrial community in the country.

By the 1920's foundrymen realized that industry leadership, through a strong trade organization, was mandatory. No responsible body of foundrymen was available to represent the rapidly growing gray iron industry properly, although other branches of the foundry industry had been organized for many years. Trade organizations of competitive industries already were engaged in research and merchandising programs, threatening the present and future markets for castings.

Early in 1928 a group of 54 interested gray iron foundrymen representing 27 foundry centers formally met in Pittsburgh, and later in Philadelphia, to discuss the foundation of a national trade association. Impressed by the admonitions of industry leaders, these representatives realized that it was indeed mandatory for their industry to become unified and equipped to develop an effective long-range program. A unanimous resolution was adopted to form a national organization of gray iron foundries to be known as the

Gray Iron Institute, and many leading foundrymen pledged their support of its objects and purposes.

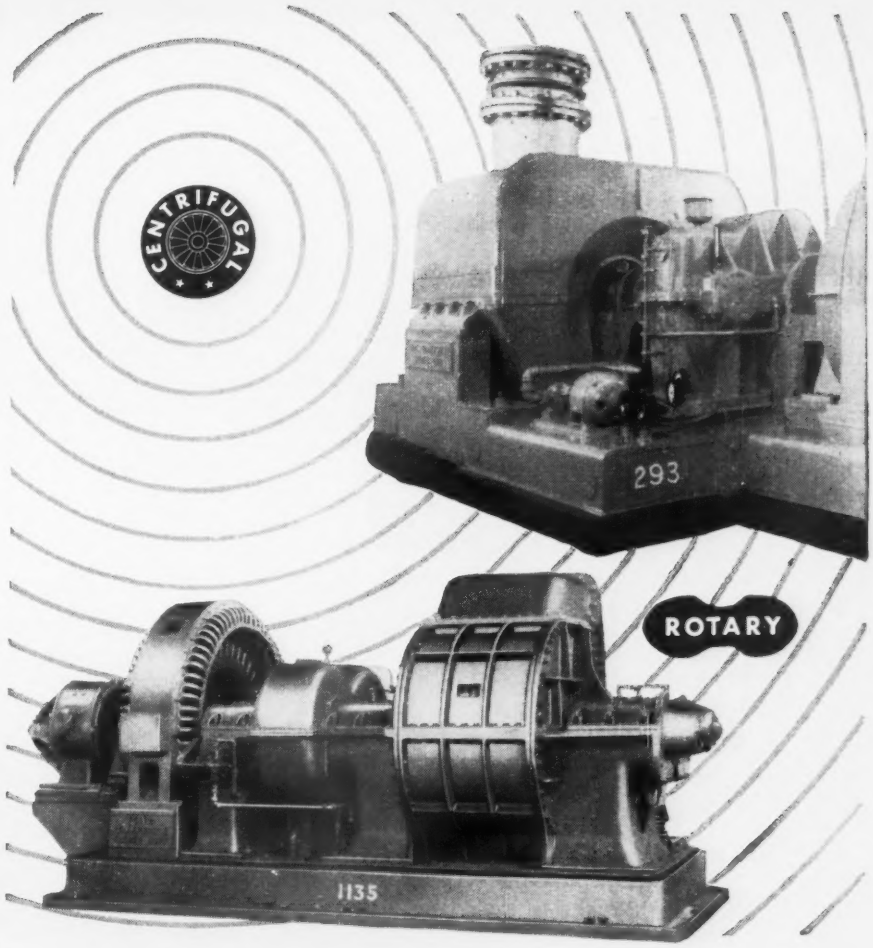
Walter L. Seelbach, now president of the Superior Foundry Inc., Cleveland, was elected to serve as the institute's first president, and later served a second term in 1943-45. Other officers elected at this organizational meeting were: First vice president, B. H. Johnson, Cresson-Morris Co., Philadelphia; second vice president, A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.; treasurer, H. S. Chafee, Builders Iron Foundry, Providence, R. I., and secretary pro tem, John L. Carter, Barlow Foundry Co., Newark, N. J. Mr. Johnson is the only original officer not living today.

The late WILLIAM WATTS ROSE, for ten years executive vice president, GIFS

Arthur J. Tuscany, who died just recently, was selected as the society's first full-time executive secretary. In 1936 Mr. Tuscany was succeeded by the beloved Col. William Watts Rose, who died several years ago after serving for 10 years as the organization's executive vice president. Raymond L. Collier became the chief staff executive in 1947 and served until 1950. All of these men served the society faithfully and with distinction, and much credit is due each of them for his contribution in expanding the usefulness of the society.

Tribute also should be paid the numerous foundrymen who gave their services as officers, directors and committee members over the years. Fourteen different men have served the society as president. Mr. Johnson succeeded Mr. Seelbach as president in 1930-31, followed by Mr. Hageboeck in 1931-33. Succeeding presidents were:

Franklin R. Hoadley, Farrel-Birmingham Co., Ansonia, Conn., 1934-35; Charles B. Magrath, Greenlee Foundry Co., Chicago, 1935-36; Peter E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, O., 1936-38; C. R. Culling, Carondelet Foundry Co., St. Louis, 1938-39; Charles J.



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BUILD THE DUAL-ABILITY LINE

To meet the varying problems of handling air or gas, in industrial processes, Roots-Connersville builds two complete lines of blowers and exhausters—Rotary Positive and Centrifugal. Together, they cover capacity requirements from 5 cfm to 100,000 cfm in single units. Centrifugals are available in multi-stage units, as illustrated, or in single-stage types.

Thus, this exclusive *dual-ability line* permits selection (without prejudice as to types) to meet the needs of most moderate pressure applications. Regardless of their sizes or types, R-C Blowers are unmatched in reliability, operating economy and long-time performance. Built into them is almost a century of specialized experience in handling gas and air, which is our exclusive business.

In addition to blowers and exhausters, R-C products include a wide range of gas and vacuum pumps, meters, inert gas generators and other related equipment. So, whenever you have a need for moving or measuring gas or air, we suggest consultation with the R-C Specialists.

ROOTS-CONNERSVILLE
Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC.
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Miller, Fremont Foundry Co., Fremont, O., 1939-41; Andrew C. Denison, Fulton Foundry & Machine Co., Cleveland, 1941-43; Herbert L. Edinger, Barnett Foundry & Machine Co., Irvington, N. J., 1945-46; Howard A. Stockwell, Barbour Stockwell Co., Cambridge, Mass., 1946-48; Hermann P. Good, Textile Machine Works, Reading, Pa., 1948-50; Edward L. Roth, Motor Castings Co., Milwaukee, 1950-52. Current president is Henry J. Trenkamp, Ohio Foundry Co., Cleveland.

Today, 25 years after its formation, the society's original aims and precepts are still being carried forward. In 1928, emphasis was placed on the need for common meeting grounds, the need for standard cost accounting procedures, the need for publicity and national advertising, the need for technical research and development, the need for terms and conditions of sale and for other management aids which could be gained only through free interchange of information based on mutual trust.

Today, the Gray Iron Founders' Society, with 550 member companies representing about 75 per cent of the gray iron production, can point with pride to the many accomplishments over the last 25 years.

Foundry Costs—By 1930, a basic cost manual was issued which enabled even the smallest foundry operator to understand and control his production costs better than before. Revised in 1949, this Cost Manual No. 1 has received international recognition for its sound, yet basically simple cost system. At present, the national cost committee is putting final touches on Cost Manual No. 2, which will offer advanced recommended cost accounting procedures in the melting, core, mold, and clean and ship departments. Advanced cost methods for these departments have been issued to all society members in preprint form.

Local cost groups have been formed in 18 geographic regions from coast to coast. These groups, sponsored by the society, are administered by three area cost consultants who are always available for private consultation with any member company. At the cost meetings the consultant reviews the average costs of the past quarter, and each participant has the opportunity to check his costs with those of other foundries in his district by scanning a "blueprint" listing items of cost. Each company is represented by a code number to protect identity. Each month the society cost consultant publishes pertinent cost information on current cost problems in the society's house organ.

Technical Work—The society's well established technical department actually is engaged in product development work and is improving the value and usefulness of gray iron castings to industry through consultation with society members. All phases of the production of castings are included. The society is ready to enter directly into basic research. In preparation for this important activity, a sound foundation has been created both with the membership and with nearly a score of co-operative technical societies and organizations, here and abroad.

An authoritative Gray Iron Handbook is being written now, four important sections of which already have been given wide distribution. The handbook, designed as a guide for castings buyers, is an important step in the society's constant program of promoting the increased use and sale of quality gray iron products. In addition, a constant flow of technical reports and publications is directed to member companies for internal use and as direct mailing pieces to prospective purchasers of castings. Monthly technical articles appear in the society's house organ, *Gray Iron News*.

Gray iron, the material which offers such outstanding engineering characteristics, now stands on the threshold of new developments which are exciting to foundry engineers. Many of these developments are still too recent to evaluate with accuracy, but they definitely offer a new challenge to rival materials. As the society goes into its 26th year, the industry is intent on finding new business with the help of such industrial evolution. Techniques of production are being developed to improve properties of the iron and dimensional tolerances and surfaces of castings, all of which are efforts to extend the already wide range of gray iron uses.

Local Management — In recent years a score of local management chapters have been organized in the principal foundry centers. They enable foundry managers to meet frequently and to become better acquainted. More importantly, they provide a means for free interchange of information on common business problems at the local level. The groups provide a two-way channel of information between the society headquarters and its members; the industry thus can express itself fully and precisely on national problems for the guidance of the Gray Iron Founders' Society's board of directors.

The society's statistical committee is responsible for the collection and dissemination of industry statistics covering over 30 market areas of the industry. Each month the statistical summary brings to the members current data, most of which is not available from any other source —such as the industry's current operating rate, wage rates, productivity and injury frequency rates. This committee also is responsible for ad-

(*Continued on page* 182)

50TH ANNIVERSARY PARADE: In observance of its 50th anniversary, Clark Equipment Co. recently staged a "materials handling parade" at its Buchanan, Mich., plant. Over 40 different models of materials handling trucks were included, ranging from powered hand trucks to 45,000-lb capacity straddle carriers. Products recently added to Clark's line through acquisition of Ross Carrier Co. and its subsidiary, Michigan Power Shovel Co., also were displayed. In the center of the picture is a truck tractor, the company's first materials handling product

Sound?

Radiography removes the doubt

With the plane headed home and landmarks all "zeroed-in," the soundness of this casting becomes vitally important. For it is part of an aircraft instrument which must be accurate without fail.

That is why each of these castings is subjected to the searching eye of radiography. It is the way to be sure no hidden flaw, no gas holes or porosities exist.

Proving soundness with x-rays has become common practice with more and more suppliers of quality castings. They have found it helps build an enviable reputation for delivering only good work. And besides, by radiographing pilot castings, changes in procedures are frequently indicated which increase the yield in long runs.

If you'd like details on how radiography can improve your operations, get in touch with your x-ray dealer. Or, if you like, write us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...
another important function of photography

Kodak
TRADE-MARK

for better
ALUMINUM castings
at lower cost

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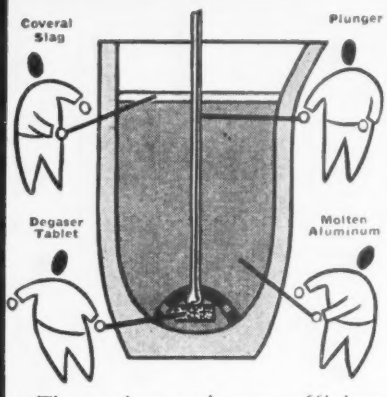
ALL-IN-ONE
TREATMENT



The easiest and most efficient method yet devised for degassing and grain refining all aluminum alloys.

* *Reduces metal loss*
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* *Metal-free dross*
* *Eliminates gas holes*
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**EASY—EFFICIENT
ECONOMICAL—SAFE**

Melt aluminum under protecting layer of FOSECO COVERAL #11. Ten minutes before pouring, plunge a FOSECO DEGASER #190 tablet into the liquid metal. Skim the dross and the metal is ready to produce finest castings.

FOSECO COVERALS — DEGASERS — GRAIN REFINERS — Available for all aluminum alloys. Backed by nearly a quarter century of "know-how" and experience.

MAKE YOUR OWN TEST! Write today for samples and complete information. If you have a special problem, tell us about it—we will be glad to help you.

FOUNDRY SERVICES, Inc.
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New York 16, N. Y.

FOUNDRY SERVICES *(Canada)* LTD.
201 Alice Street, Guelph, Ontario

(Continued from page 180)

ministering special surveys and studies for governmental or industry use. The work provides essential tools for foundry managers in the guidance of their plant operations.

Sales Promotion — In 1928, the founding members firmly believed that the industry needed strong national publicity and sales promotion to attract new attention to its ever improving product. Because of limited market areas, few jobbing foundries consider advertising on a national basis. For this reason, the society has undertaken a program of national advertising series and other promotional activities designed to increase product sales. A merchandising program was created five years ago, and today aggressive advertisements promoting the use of gray iron castings appear in seven leading metal journals. Approximately one-sixth of the society's annual budget is devoted to this worthwhile activity, which offers members, in the form of reprints of the advertisements, additional direct mail promotional material.

Each year the society sponsors a redesign contest resulting in publicity for gray iron components which were produced formerly by the use of a competitive material or process.

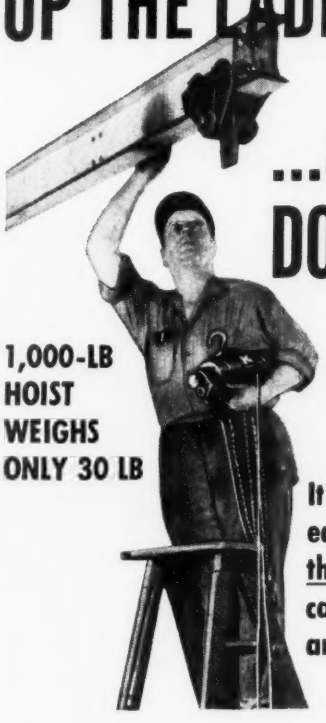
With an eye to publicity, frequent news releases are issued by the society to bring gray iron to the attention of the trade. A friendly trade press also solicits for publication frequent articles prepared by the society.

Wage Reports—Annually a wage survey is undertaken by the society, covering the rates paid in 39 job classifications in 50 labor areas. This wage report is recognized as the most comprehensive and authentic report of its kind in the gray iron industry, and it is enthusiastically supported by both members and nonmember units of the industry.

Accident Prevention—Sincere attention is being given to the industry's accident prevention activities. The society's safety committee presently is exploring a number of new activities designed to lower the industry's rate. As a preliminary step, the society has issued a safety manual, "How You Can Work Safely," for distribution to gray iron foundry employees. Hundreds of foundries have standardized on this booklet, and over 85,000 copies are in use today in both large and small plants.

Sales Terms—One of the most important documents compiled and distributed by the society is "Terms and Conditions of Sale of the Gray Iron Foundry." Originally approved

UP THE LADDER
...and DOWN



1,000-LB HOIST WEIGHS ONLY 30 LB

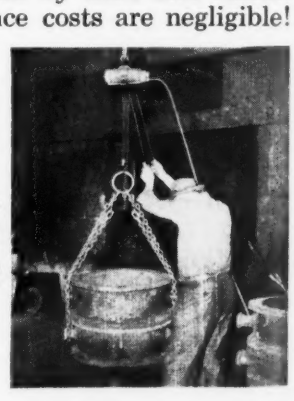
It's as easy as that to carry and hang

KELLER
Air Hoist

One man handles it easily... makes replacements in minutes... avoids "down time" that might keep a whole department idle.

VARIABLE SPEED with fingertip control—spots loads accurately.

CAN'T BURN OUT from stalling. Not affected by dust and fumes. Maintenance costs are negligible!



Keller Hoist handles a flask easily ...and spots it accurately

SEND FOR DETAILED INFORMATION

KELLER
Pneumatic Tools

KELLER TOOL CO., GRAND HAVEN, MICH.

by the National Association of Purchasing Agents in 1931, the industry's customs and usages were reapproved by NAPA in 1949 with minor revisions. This document serves as a protective umbrella over the entire industry, and countless thousands of copies have been circulated among the industry's customers. The society's terms and conditions of sale committee frequently prepares special reports regarding developments which may affect the industry's relations with its customers.

Each month members receive *Gray Iron News*, the society's house organ. It contains a roundup of industry news designed to keep the foundry executive posted with up-to-date news about the industry and its products. Use of this publication as a regular medium of information reduces the necessity for more frequent mailings of bulletins.

Government Contacts—The country has been at war or in a serious national emergency for over a third of the society's existence. Because of the industry's manifold problems during World War II, the society opened a branch office in Washington to serve the industry and the government better. Most members were thus spared the necessity of frequent visits to Washington, and those who did make them were grateful for the way this branch office expedited their business in the capital.

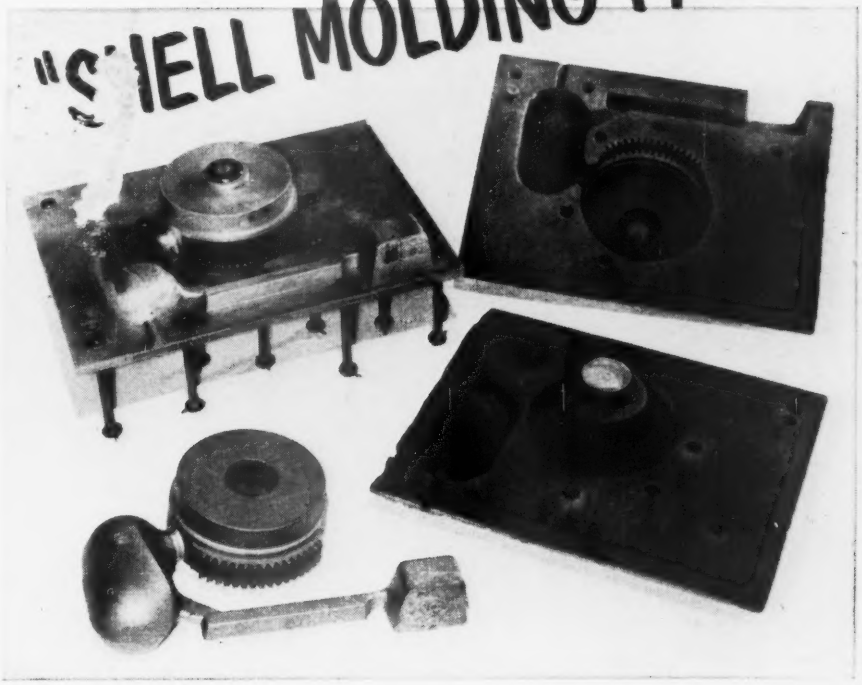
As in the recent Korean action, the society promptly distributed and clarified official government pricing and material orders and controls. Numerous conferences with government officials prevented or eased hardships on the castings industry. The society in both conflicts acted promptly on defense agencies' requests for recommendations for qualified foundrymen for industry advisory committees and thus assured fair and competent representation in wartime on matters of direct concern to our industry.

By these and other activities, the society has had a healthy influence on the welfare of the industry. Thanks to an ever-growing and stronger membership, the industry constantly is becoming better equipped to meet its problems.

Improved relations with the industry and government have been made possible because of the intelligent co-operation of members representing the majority of the industry's tonnage. The society's members are pledged to a sound program and look to the leadership of officers, directors and committee and staff members, all of whom are constantly on guard to meet the changing problems which confront the industry.

Another Foundry using DUREZ Resins reports...

"SHELL MOLDING PAYS"



Benefits worth checking

- Dense, rigid molds
- Minimum cycle time
- High bonding strength
- Accurate dimensions
- Smooth surfaces
- Minimum cleaning
- High output per man

Complete success in shell molding with automatic machines covers far more than man-power economy. The molds themselves must cure fast, set rigid, and produce castings having a pattern-like finish with smooth contours and clear definition. This minimizes cleaning up.

Using Durez phenolic resins, Production Pattern & Foundry Co. gets these results. Note the finish of this casting as it comes from the mold. It emphasizes the advantage of using resins developed for foundry operations by specialists.

Durez can help you. We have specialized in developing and producing phenolic resins for 32 years. Whether or not you plan to use automatic equipment, our engineering staff will gladly work with you to get the best results from your shell molding.

DUREZ

PHENOLIC RESINS

MOLDING COMPOUNDS

INDUSTRIAL RESINS

PROTECTIVE COATING RESINS

Made by America's largest producer of phenolic plastics exclusively.

DUREZ PLASTICS & CHEMICALS, INC.
1010 Walck Road, North Tonawanda, N. Y.

Write or use the coupon!

DUREZ PLASTICS & CHEMICALS, INC.
1010 Walck Road, North Tonawanda, N. Y.

Send me information on the shell molding process.

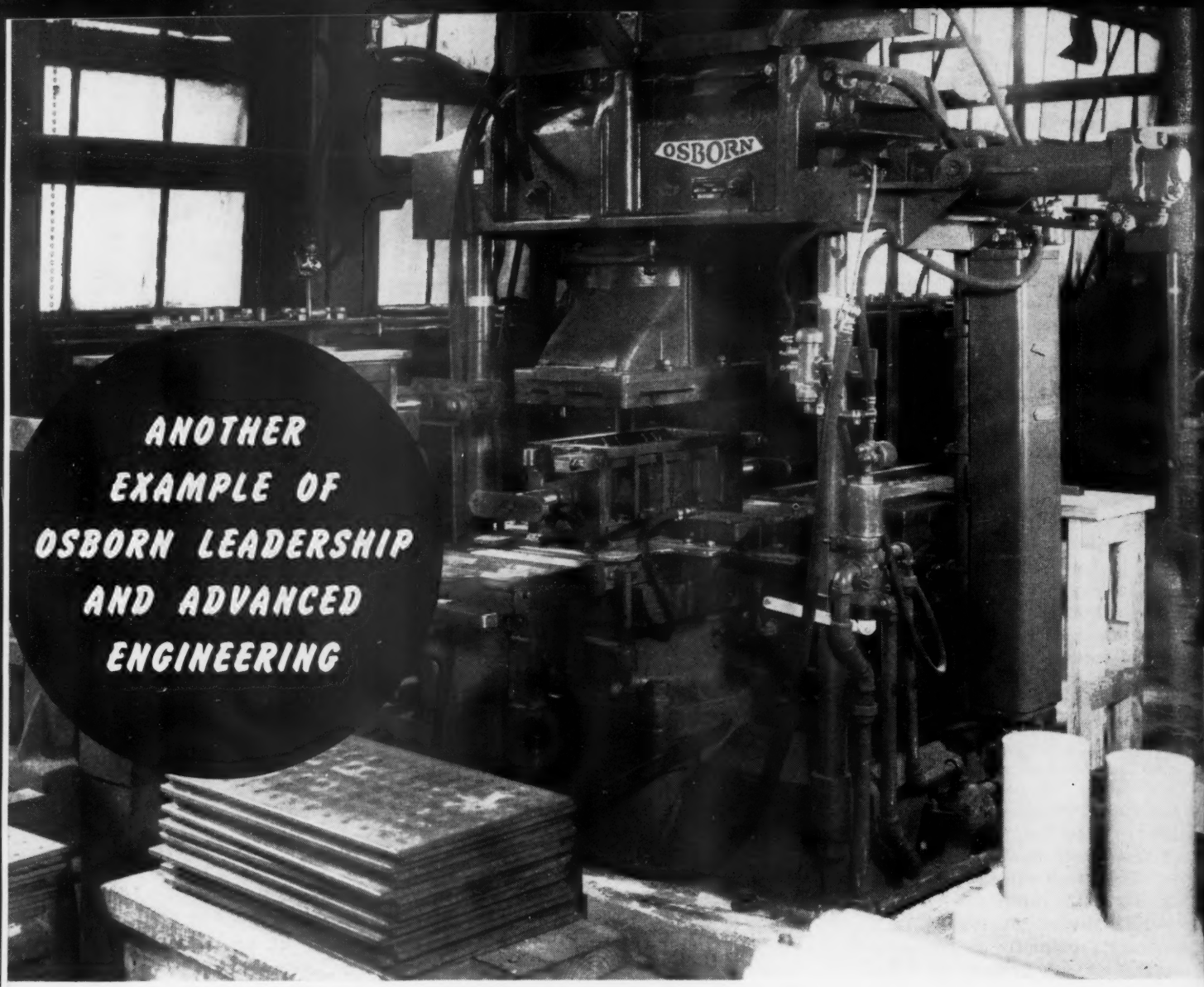
Name .....

Company .....

Address .....

City and State .....

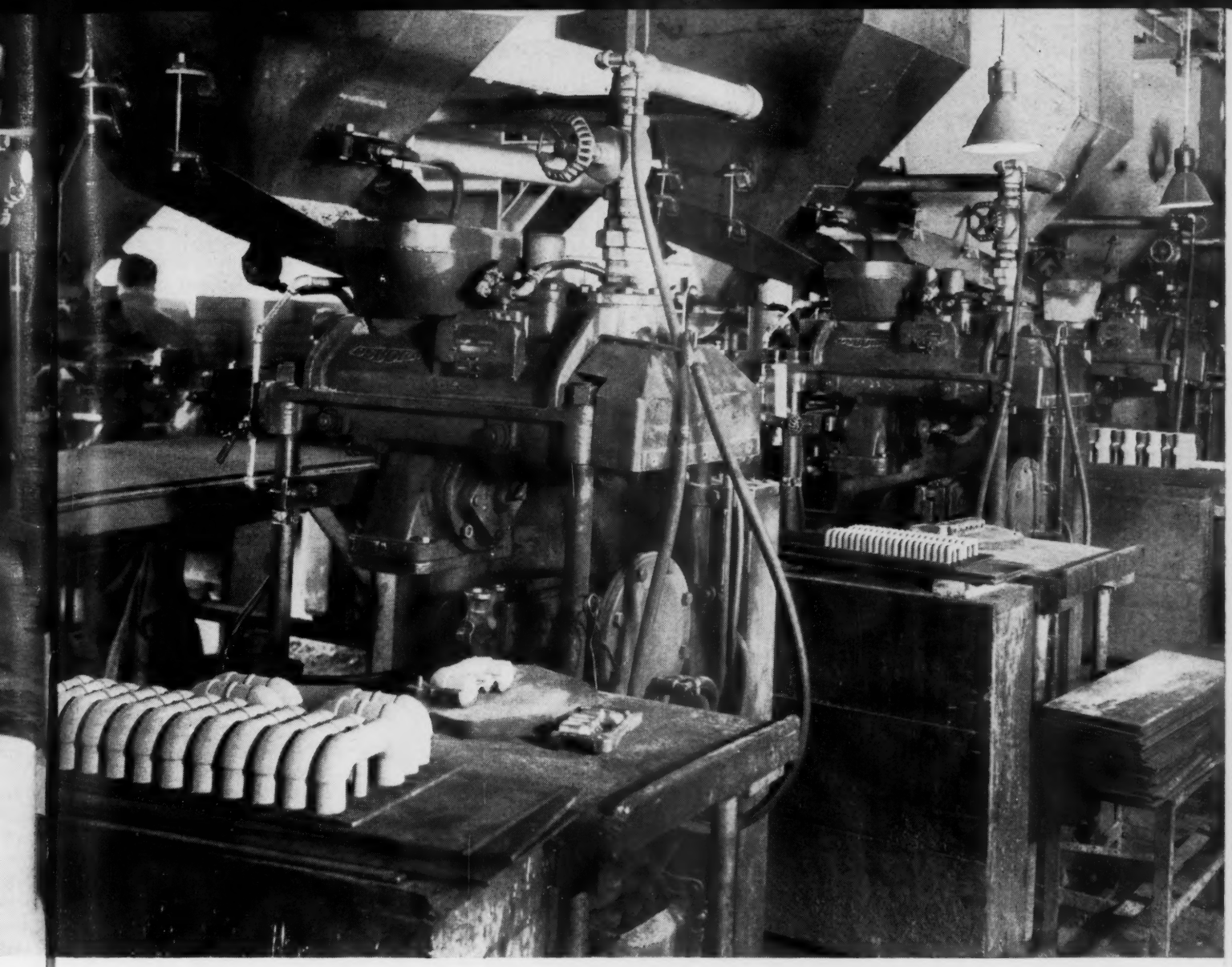
PHENOLIC RESINS THAT FIT THE JOB



Osborn Draw-type Core Blower with automatic controls and core box locator, and rollers on the table.

Get more cores at less cost with OSBORN CORE BLOWING MACHINES

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland 14, Ohio



Osborn Diaphragm-type Core Blower with automatic controls, horizontal clamps, and core box ejector.

OSBORN has the right size and type of core blowing machine for every core blowing job. Both diaphragm and draw-type machines can be furnished with automatic controls to operate on preset time cycles. Osborn Core Blowers can be furnished complete with such accessory equipment as horizontal clamps for vertically parted core boxes, rollers on the table for ease in handling large core boxes, core box locators, and core box ejectors to suit individual job requirements. A wide range of sizes of interchangeable sand reservoirs and blow plates are stocked for all model machines.

INVESTIGATE NOW

Send for full details on Osborn's latest advancements in fast, efficient core blowing. Write *The Osborn Manufacturing Company, Dept. 908, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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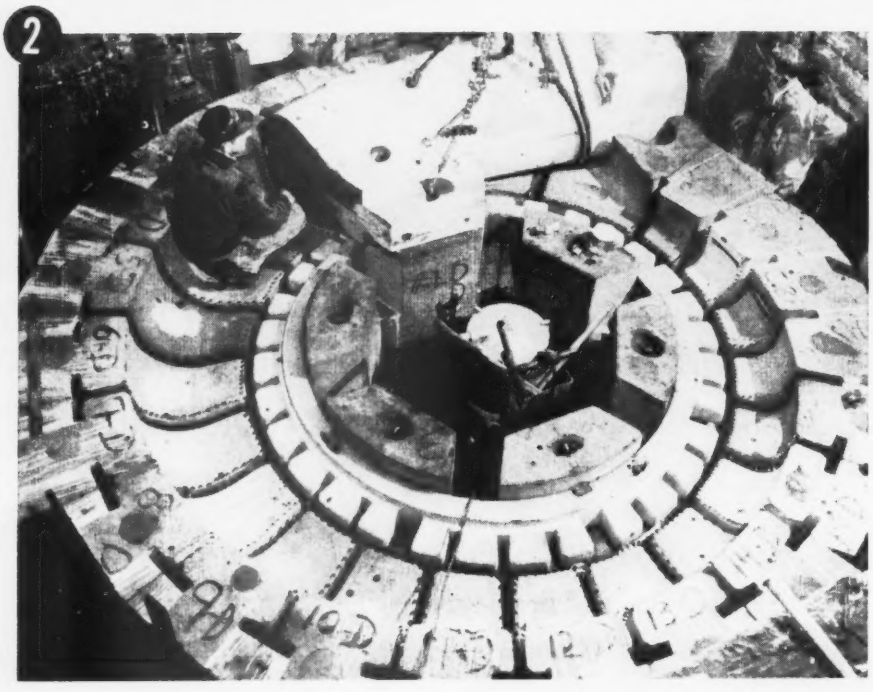
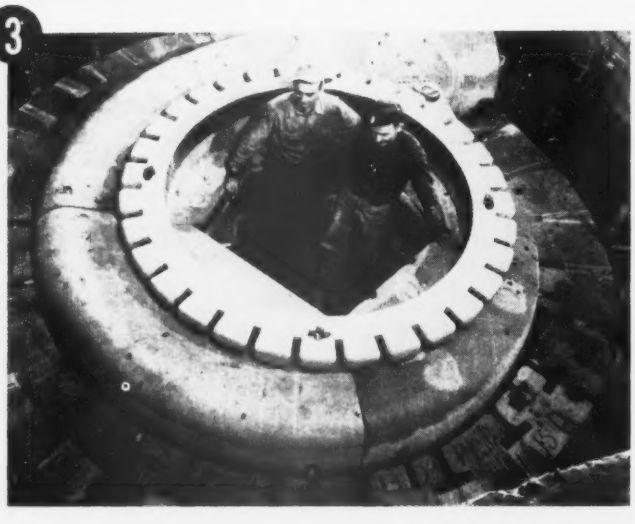
MOLDING MACHINES CORE BLOWING MACHINES INDUSTRIAL BRUSHES

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Big Castings Require Big Molds





HERE are four steps in the production of what is said to be the largest single piece steel pump casing ever produced on the West coast. It is one of a number of castings being poured at National Supply Co.'s Torrance, Calif., foundry. The cases are approximately 10 ft OD, 14 ft, 4 in. over discharge flange, and weigh 38,000 lb. To minimize weight while maintaining a high safety factor, careful engineering design and foundry production methods are practiced.

Pit molding is employed, and Fig. 1 shows seven huge cores, the first of 89 which go into the mold, already in place. One of the cores that will form the water passage and internal hydraulics of the case is being placed by overhead crane into the partially assembled mold in Fig. 2. The second toothed ring core, forming internal pockets in the case, is shown in Fig. 3 on top of the water passage cores.

The mold is poured with electric furnace steel, and, after cooling, the casting is broken out, risers and gates burned, cut and ground off, and the casting cleaned and heat treated to develop the required physical and mechanical properties. The rough casting, ready for machining, is shown in Fig. 4.

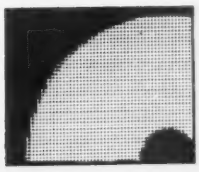
The Byron-Jackson pumps made with these castings lift water at the rate of 90,000 gpm to a height of 300 ft. They are driven by 9000-hp electric motors and deliver water from the Colorado river to Los Angeles. Pumps in the complete aqueduct system lift water 1600 ft in five steps. More than 100 miles of tunnels save pumping to even greater heights.

NEW! BAY STATE BZ SAF-T-CUT

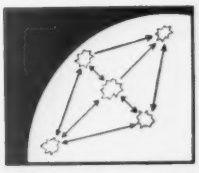
... A TRULY GREAT REINFORCED CUT-OFF WHEEL

- GREATER SAFETY
- GREATER COOLNESS
- GREATER LIFE (10 TO 20%)
- GREATER STRENGTH (100%)
- GREATER CUTTING SPEED (UP 20%)
- GREATER RESISTANCE TO LOADING

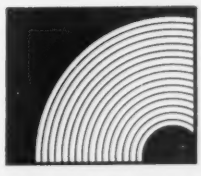
ACTUAL TESTS PROVE THAT BZ SAF-T-CUT WHEELS ARE... STRONGER... FASTER... COOLER



Reinforced with tough glass fiber for rugged STRENGTH and LONG LIFE.



New "BZ" Bond holds abrasive particles exactly right for OPTIMUM CUTTING POWER.



New Spiral Grooved sides give COOLER, CLEANER CUTTING on the 14" to 20" dia. sizes.

Micro photo shows "air-cooling" groove design that adds NON-BURNING feature.

BAY STATE ®

Available in Aluminum Oxide abrasive (for cutting metals), and Silicon Carbide abrasive (for cutting non-metallic materials). Call in your BAY STATE REPRESENTATIVE for details, or write for size and specification data.

Development of the new "BZ" bond was aimed at improving safety, cutting rate, and wheel life for all cut-off work on steel bars, pipe, angle iron and other structural shapes, as well as ferrous and non-ferrous castings.

Actual tests show fast, clean cuts on these materials, plus performance records of 10 to 20% better life... and up to 20% faster cutting rate than the best competition.

BAY STATE says to its sales force and to you, "We believe this 'BZ' SAF-T-CUT wheel to be the best reinforced resinoid cut-off wheel on the market today, from every point of view". Ask for a demonstration.

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.

Branch Offices and Warehouses: Chicago, Cleveland, Detroit, Pittsburgh

Distributors — All Principal Cities

In Canada: Bay State Abrasive Products Co. (Canada) Ltd. Brantford, Ont.

FOUNDRY PLAN WINNER IN SCHOOL CONTEST

A MODEL plan for a foundry, which won a division prize in the recent Delta School Shop Planning Contest, sponsored by the Delta Power Tool Division of Rockwell Mfg. Co., was designed by Edward Saks, instructor in foundry practice at the Murrell Vocational School, Philadelphia. It is intended to accommodate 50 pupils in a vocational or technical school.

Here are the major features of the Saks plan:

1. A monorail system intended to serve the entire shop area, facilitating the handling of heavy materials.

2. Enclosure of all melting units behind a glass and brick wall to restrict noise and confine fumes to an area from which they can be exhausted readily.

3. Conveniently located shower and locker rooms for workers.

4. Efficiently planned storage facilities for coke, pig iron, limestone and scrap adjacent to the melting units to eliminate excess handling.

Over-all size of the shop is 76 x 116 ft. Working area of the foundry itself is 52 x 99 ft. The furnace room is 13 x 91 ft. Roller conveyors adjacent to molding benches and squeezer machines make it possible to handle molten metal, heavy molds and castings with a minimum of effort and a maximum of safety.

The plan places the shower and locker rooms in a corner away from the foundry operation, but close enough so that they are readily accessible to workers.

Proper placement of storage facilities reduced the materials handling problem. Storage facilities in a line along the north wall, are provided for sand, clay, coke, limestone, pig iron, scrap iron and steel, firebrick and nonferrous metals. All bins are served by the monorail system.

On a parallel line nearby, Saks' plan calls for storage space and work area for lining ladles, an annealing furnace, electric furnaces, cupola, and two gas-fired crucible furnaces.

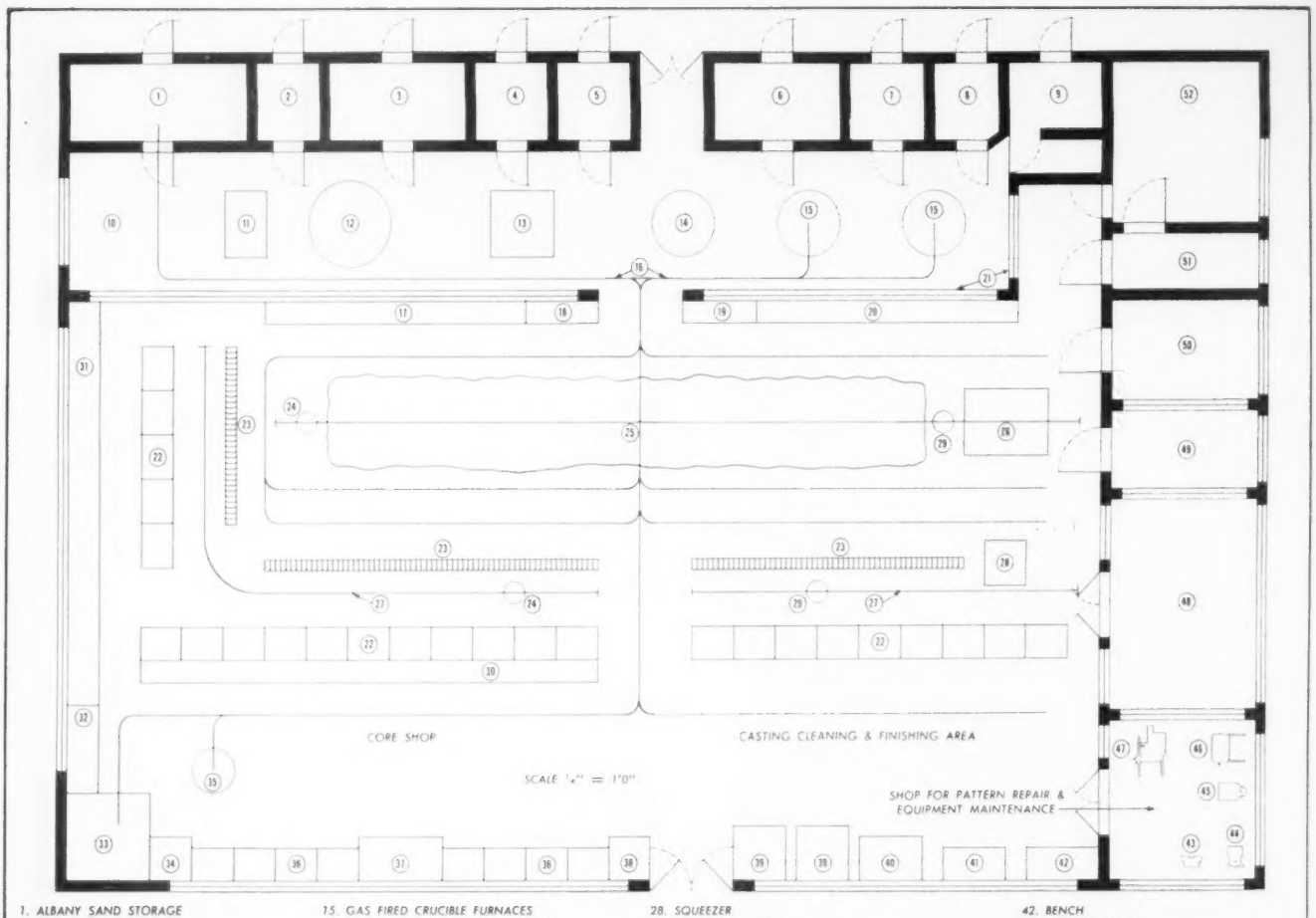
Along the west wall are storage racks for patterns and coreboxes. Parallel to the pattern storage racks are the molding benches. In the center of the shop, the plan calls for a large sand heap and floor molding area.

Near the sand heap and floor molding area are two banks of molding benches, with 11 benches in each section.

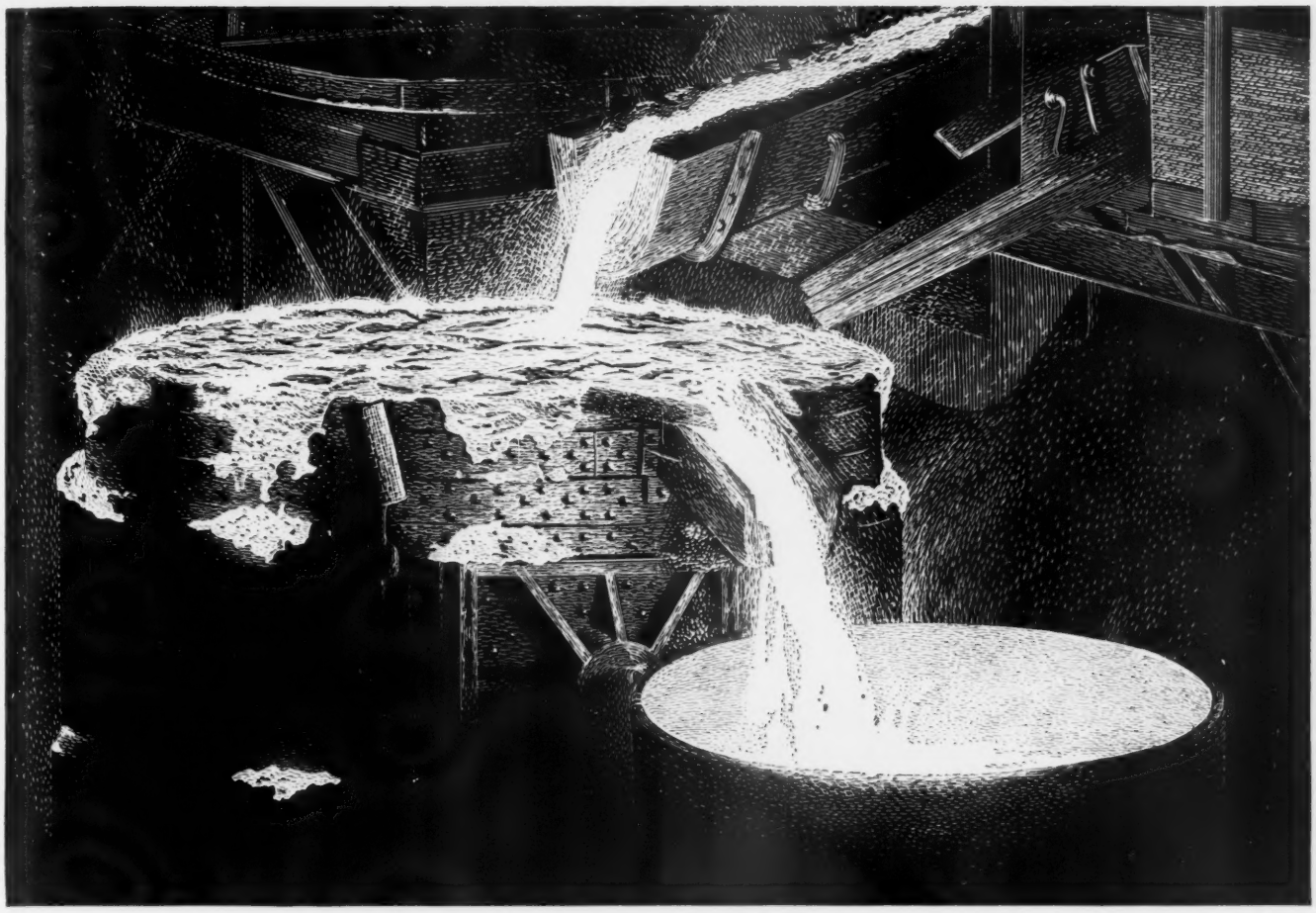
The core shop includes core sand storage, a core blower, muller, core benches, ovens and a stock core machine. In line with this, the plan provides for blast equipment, a cut-off saw, grinder and bench.

The section for pattern repair and equipment maintenance is equipped

(*Continued on page* 190)



1. ALBANY SAND STORAGE
2. RED CLAY STORAGE
3. COKE STORAGE
4. LIMESTONE STORAGE
5. PIG IRON STORAGE
6. SCRAP IRON & STEEL STORAGE
7. FIRE BRICK
8. NON-FERROUS METALS
9. CORE OIL, PARTING, ETC.
10. STORAGE SPACE & WORK AREA FOR LINING LADLES
11. ANNEALING FURNACE
12. ELECTRIC STEEL FURNACE
13. ELECTRIC INDUCTION FURNACE
14. CUPOLA
15. GAS FIRED CRUCIBLE FURNACES
16. MONORAIL SYSTEM FOR HANDLING MOLTEN METAL, FLASKS & SAND
17. FLOOR FLASK STORAGE
18. CLAMP RACK
19. GAGGER BIN
20. FLASK STORAGE
21. GLASS ABOVE MASONRY BASE
22. MOLDING BENCHES
23. ROLLER CONVEYOR
24. RIDDLE
25. SAND HEAP & FLOOR MOLDING AREA
26. JOLT ROLLOVER
27. RAIL FOR RIDDLE
28. SQUEEZER
29. GYRATORY RIDDLE
30. CORE STORAGE, CORE PLATES, CORERODS
31. PATTERN STORAGE RACKS
32. CORE BOXES
33. CORE SAND STORAGE
34. CORE BLOWER
35. CORE SAND MULLER
36. CORE BENCHES
37. CORE OVENS
38. STOCK CORE MACHINE
39. SAND BLAST EQUIPMENT
40. CUT-OFF SAW
41. GRINDER
42. BENCH
43. GRINDER — DELTA
44. 12" DISC SANDER — DELTA
45. 17" DRILL PRESS — DELTA
46. 10" TILTING TABLE CIRCULAR SAW — DELTA
47. 20" BAND SAW — DELTA
48. LIBRARY, STUDY, LECTURE & VISUAL AID ROOMS
49. SAND TESTING LABORATORY & PHYSICAL TESTING
50. TOOL CRIB
51. LAVATORY
52. SHOWER & LOCKER ROOM



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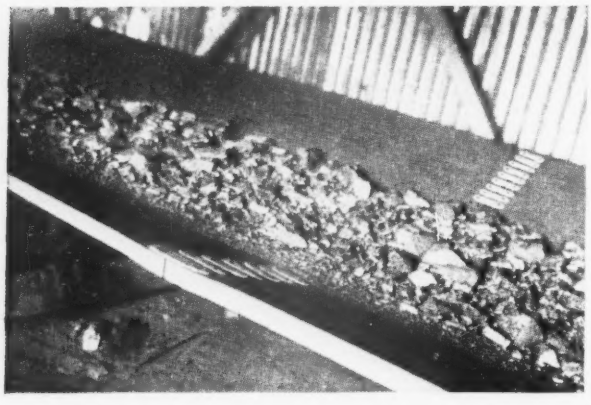

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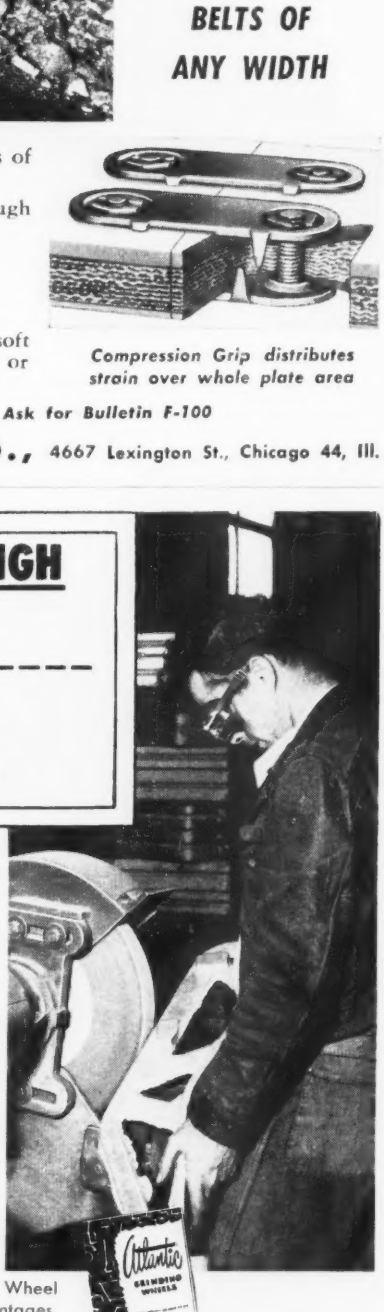

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(*Concluded from page* 188)

with a grinder, 12-in. disk sander, 17-in. drillpress, 10-in. tilting table circular saw and 20-in. band saw.

Judges for the contest were: Gilbert G. Weaver, director of training, Bureau of Vocational Curriculum, Development and Industrial Teacher Training, of New York State Education Department; Dr. William W. Theissen, assistant superintendent of Milwaukee public schools; Dr. C. H. Groneman, head of the industrial education department of Texas A. & M. College; Dr. C. C. Caveny, dean and chief executive officer of the Chicago campus of the University of Illinois; and Hans W. Schmidt, school building planning consultant.

Cost of Shell Molding

(*Continued from page* 158)

3. While matched plates may seem satisfactory for certain green sand work, a cope and drag type pattern is required for shell molding—that is, a pattern with an impression on both sides of the plate is unsatisfactory for production shell molding.

4. An increased pattern plate thickness is often desirable for shell molding which increases the material cost.

The shell making equipment, to be satisfactory for short run production, must provide for a quick change of patterns. By deducting the time required for pattern change multiplied by the number of changes per day, it is possible to calculate from the table the increased cost per shell of the lower number of shells produced from the charts.

The capital investment required for a given production in shell molding can be closely estimated from the following. The equipment required for a complete shell mold foundry is:

1. Sand-resin mixer.
2. Shell making apparatus.
3. Inspection and assembly table.
4. Pouring arrangement.
5. Conveying equipment.
6. Shakeout arrangement.
7. Bins and conveyor or elevator for backing material.
8. Vibrating equipment.
9. Gate grinding equipment.

A muller makes a satisfactory mixer for the present powdered dry resins, and will be a necessity for mixing the liquid resins for coated sand. Other types of mixers have been used satisfactorily with powdered resins.

To make shells, the following functions must be performed.

a. Heat pattern.
b. Apply mixture to heated pattern.
c. Permit mixture to remain on pattern for required time.
d. Remove excess mixture.
e. Permit shell to cure.
f. Remove shell from pattern.

g. Apply release agent to pattern.

Any shell making machine which is capable of performing all these functions in a satisfactory manner can make good shells. The speed with which the shells can be made depends on the time required to perform the required functions and the time required for the cure. Unfortuately, just going through the motions does not assure that the functions are being performed satisfactorily.

Defective Shells—The two greatest causes of bad shells (assuming a satisfactory mixture is being used) are voids or cavities along the walls of vertical surfaces and cores, and warpage. The former is caused by incorrectly investing the pattern. The investment procedure should be such that the mixture is spread onto the pattern from one side to the other, or from one end to the other in such a manner that it does not "cast shadows." This requires a spreading action from directly above the pattern.

A vertical drop is often unsatisfactory because air sometimes is trapped in core holes. A rollover from a dump box arrangement "casts shadows," and this permits bridging over of some vertical surfaces on the opposite side to which the mixture approaches.

Warped shells seems to be the serious concern of many foundries entering the shell mold field. Warpage sometimes can be reduced by use of a faster and more rigid setting resin. This approach is being pursued by resin manufacturers. A method found to eliminate the problem completely is to eject the shell in the inverted position, and catch it on a suitable catching arrangement which will conform to the contour of the back of the shell and give adequate support at all points. Another advantage of this method of stripping is that the shell or shells do not have to be removed before the next cycle starts, which avoids having an operator's attention focused on the stripping arrangement. This permits a faster cycle, especially when using a large carrier size which, by use of dividing strips, produces several shells.

A third cause of bad shells is the tendency of the green mixture to fall away from the pattern when in an inverted position. The cure for this is to never stop the pattern in an inverted position.

To summarize, a shell making machine should incorporate the following features:

1. Application method must assure good investment with all types of patterns.

2. Pattern should rotate 360 degrees to remove excess mixture, and should *never* stop or be subjected to jarring or vibration while inverted.

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3. Pattern must be continuously supplied with enough heat to maintain desired cycle.

4. Removal of shell should be done onto catching arrangement, rather than up, to have shell removed manually or automatically from top.

Inspection and assembly of shells is facilitated by use of a table large enough to hold several shells. It should have a cut-out section under which are air pipes operated by a foot valve or knee valve, to blow out the shells before assembly. One satisfactory procedure is to inspect, blow out, put shells together, attach clamps (spring clamps, fence staples, clothes pins, etc.) place paper towel over sprue, dip edges in molten paraffin to seal out dust and foreign matter, and place in pouring containers or racks. The paraffin bath can be contained in a section of channel iron, end pieces welded in, with a thermostatically controlled heating element keeping the temperature at just above the melting point.

Subsequent operations, unless handled efficiently, can prove costly. They involve placing the shells in pouring containers, filling containers with back-up material, transporting to pouring area, pouring, cooling, shaking out, preparing backing material for reuse, and removing, cleaning and preparing castings for shipment.

Minimize Handling

To make these operations economical, manual handling must be minimized. Pouring containers may be cars on a track, or boxes carried on monorails. The backing material should be contained in a suitable hopper, and the shakeout should be adjacent to it to reduce moving backing material.

Size of the pouring container is dictated by the maximum size mold to be poured, and an analysis of the entire time cycle, from shell making through shakeout. A large container can be vibrated very nearly as quickly as a small one and will hold more molds. If the pouring is intermittent, this should also be taken into consideration in choosing the size of the pouring container.

For use with the shell making machines described previously pouring cars with inside dimensions of 32 x 48 x 18 in. for the small machine (20 x 30 in. shell) and 32 x 48 x 30 in. for the large machine (30 x 50 in. shell) have been found satisfactory. These containers should have provisions for emptying the backing material underneath or for dumping it into a pit or shakeout. They should also provide continuously adjustable means of holding the shells before the backing material has been put in. If shell storage is desired, this latter feature can be provided in rack inserts, which

"The foundry workers just chose me as the material they'd most like to mold!"

may be handled by monorail, and should be capable of being stacked one on the other, either full or empty. Such an arrangement permits the racks to be used as tote boxes to carry the castings to the cleaning area also.

After the backing material has been dumped into the pouring container, it should be compacted to hold the mold securely. This is readily possible when coarse, dry, angular grain sand is the backing medium, since it will "crawl" up under projecting parts of the shell and become firmly packed under influence of a suitable vibrator. Such support to the under side of projecting surfaces of a mold is more difficult to obtain with shot as the backing material. Other disadvantages of shot are contamination in pouring, causing loss of shot, cost of handling equipment, and difficulty in achieving the necessary "lock-in" that is readily obtainable with sand.

No mention has been made of the practice of pouring without backing, since such pouring is limited to a narrow range of castings. The limits are determined by the time required for the metal to solidify versus the time required for the resin to oxidize. This is true whether the metal be steel poured at 3100° F or aluminum or magnesium poured at a much lower temperature.

A typical shell mold foundry layout is shown in the accompanying diagram. It requires six to eight men to operate, including melting, pouring and preparing for shipment. Production per 8 hours would be of the order indicated in the table. To double production, another shell making machine and two or three more men (or women) could be added. Further expansion of production facilities would require one more shell making machine, pouring cars and track extension. Capital investment cost of the entire layout as shown adds up to less than $8000 exclusive of installation, melting and pouring facilities and building.

Even though shell mold practice has made impressive advances and information concerning it has become more readily available, a foundry entering the shell mold field can often avoid much expense and many delays by engaging competent shell mold engineering service. To get into production as soon as possible this engineering help should be on the application and procedure side, rather than of a research nature.

Film Shows Operation of Apprentice Program

The development of an apprentice into a full-fledged journeyman is graphically depicted by "Apprentice Training," a documentary film now available to private groups without charge at regional offices of the Bureau of Apprenticeship, U. S. Department of Labor. W. F. Patterson, director of the bureau, notes that although "the story is that of a typical brick mason apprentice, the entire production gives a fine idea of how any good apprentice program should operate."

The film has been prepared for foreign showing in several languages. It was produced through the co-operation of the Department of State; U. S. Department of Labor; Bricklayers', Masons' and Plasterers' Union, Structural Clay Products Institute and Associated General Contractors of America Inc.

Book Review

Tax Shelter in Business, by William J. Casey and J. K. Lasser, plastic, 156 pages, 8½ x 11 in, published by Business Reports Inc., Roslyn, Long Island, N. Y. Price $12.50.

William J. Casey, lawyer, and J. K. Lasser, tax man and accountant, have gathered the main strategies and policies through which a business may hope to hold its own and even to grow in the face of today's tax structure. They cite many methods, with specific instances, by which businessmen have moved in recent years to protect their operations.

Some of the problems taken up include advertising and promotion as a tax shelter, research as a tax shelter, making money with losses, plant and equipment charge-offs and others. The authors point out that one of the major strategies in building up a business under today's tax structure is to spend tax-deductible dollars in a way which will build up future capital values.

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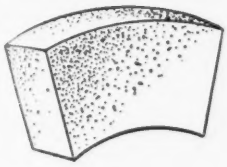

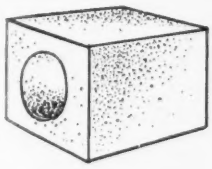

FIRE BRICK

Brand	Type	Fusion Point	Uses
WARCO XXT (Missouri High Heat Duty)	Dearied Stiff Mud	Cone 32-33 (3173° F.)	Metallurgical furnaces where slag and abrasive action is severe. Malleable furnace side walls.
BUNG BRICK (Missouri Super Duty)	Dry Press	Cone 34 (3200° F.)	Malleable furnace roofs.
MULLITEX (Missouri Super Duty	Dry Press	Cone 34 (3200° F.)	Furnaces operating at high temperatures with sudden temperature changes. Malleable furnace bottoms and roofs, non-ferrous furnace linings.
MULLITEX HB (Missouri High Burn Super Duty)	Dry Press	Cone 34 (3200° F.)	Highly resistant to slag, abrasion, shrinkage and sudden temperature changes. Electric furnace roofs ferrous and non-ferrous furnace linings.
APEX (Missouri Extra Duty)	Dearied Stiff Mud	Cone 34-35 (3200-3245° F.)	Wherever high temperatures, slag, abrasion and corrosive action prevail.

Walsh also makes: Cupola Blocks, Tap Out Brick, Slag Hole Block, Ladle Bottoms, High Temperature Ferrous and Non-Ferrous Furnace Linings.

PLASTICS

Brand	Max. Service Temp.	Fusion Point	Packaging	Type	Uses
GRAFLOK (Missouri Super Duty with Graphite Base) (Wet or Dry)	3000° F.	Cone 33-34	500 lb. drums 100 lb. cartons 100 lb. bags	Air & Heat Setting	For ram lining bull ladles, spouts, runners, patching, where molten metal covers and forms seal resulting in longer life, cleaner castings.
K-11 PLASTIC (Wet or Dry)	3200° F.	Cone 36-37	100 lb. cartons 225 lb. drums 500 lb. drums 100 lb. bags	Air & Heat Setting	Withstands electric furnace temperatures and conditions. Excellent for rammed linings, spouts, runners, burner ports, pit furnaces, patching.

CEMENTS

Brand	Max. Service Temp.	Fusion Point	Packaging	Type	Uses
GRAFLOK LADLE COATING (Dry) (Missouri Super Duty with Graphite Base)	3000° F.	Cone 33-34	100 lb. bags	Heat Setting	For brush coating over Graflok Plastic. Affords added protection and longer life.
MULLITEX CEMENT (Wet or Dry)	3150° F.	Cone 34-35	100 lb. bags 200 lb. drums 500 lb. drums	Heat & Air Setting	For laying up and surfacing fire brick subjected to severe joint erosion.
METALOK (Missouri Super Quality Mortar—Dry)	3200° F.	Cone 36	100 lb. bags	Heat Setting	Unusually resistant to slag action—highly suitable for laying up fire brick in malleable furnace sidewalls, ladles, hot metal mixers, electric furnaces, etc.

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SMALL FOUNDRIES

Comprise Larger Part of the Industry

SEVERAL interesting trends in the make-up of the foundry industry are disclosed in FOUNDRY's biennial study of the size, operating practice and facilities of individual companies. These trends are in addition to those related to the geographical distribution of the industry as discussed in the September issue, pp. 134-135.

More Small Companies—From the standpoint of number of foundries, the small plants have dominated the industry since its inception. During the last two years this condition—as measured by number of employees—has become more pronounced. Foundries employing fewer than 20 persons currently represent 45 per cent of all shops. Two years ago their share was 41 per cent.

Sixty-seven per cent of all foundries have fewer than 50 employees, against 65 per cent in 1951, while the percentage with fewer than 100 employees has increased the last two years from 79 per cent to 81.

This trend may be accounted for in part by the decline in the industry's total employment; it dropped some foundries into lower employment brackets than they occupied in 1951. Total employment in the United States and Canada, as reported by foundries, recently was 495,000, compared with 530,000 two years ago. This lag reflects both the slippage in castings production from the record 1951 pace and increased productivity per worker.

However, the major influence in increasing the predominance of the small companies appears to be the starting up of new foundries. Whereas the number of gray iron foundries in the United States declined by 68 the last two years, shops producing nonferrous castings exclusively increased, primarily those making aluminum castings. And nonferrous foundries for the most part are small shops. Meanwhile, the number of large foundries of all types has been practically stationary. Two years ago, 176 foundries reported they had more than 500 employees; today that figure is 173.

Spurt in Aluminum—For the first time in the tabulation of these data aluminum has topped gray iron in number of castings producers—2602 against 2591. A large share of aluminum's growth can be ascribed to expansion of the foundry industry on the West coast. In the last ten years the number of foundries in California has increased nearly four times as fast as the expansion for the country as a whole. Since 1951 the number of California foundries increased by 60 to a total of 481, and more than three-fourths of the gain was accounted for by producers of aluminum castings.

California also contributed the major share of the growth in number of magnesium castings makers the last two years, and today the state leads the nation in the light metal field—if only the number of foundries is considered. This would not necessarily be true on a tonnage basis, however, because of the preponderance of small shops; nearly 60 per cent of all California foundries have fewer than 20 employees.

Casting Methods—While there was no significant change the last two years in number of foundries making sand castings—a decline of 79 to a total of 4886—some other casting methods showed fairly large increases percentagewise. For instance, foundries with die casting departments jumped in number more than 50 per cent; there was a 43 per cent gain in investment castings producers, and a 20 per cent increase in centrifugal casting practice.

Permanent mold use continues to grow, an 8 per cent increase since 1951 bringing the number of foundries making permanent mold castings to nearly 600 in this country and 60 in Canada. Number of plaster mold casters today is practically the same as in 1951. The number of foundries reporting they were making shell mold castings—about 200 in the U. S. and Canada—no doubt would be swelled considerably if it included those doing experimental work with the process but not yet in production.

Melting Equipment—Most noticeable change since 1951 in melting facilities operated by foundries is a 25 per cent increase in number of electric furnaces employed. The total of 1816 units includes both arc and induction types. Cupolas show a slight drop since two years ago, open hearths a moderate increase, and the number of converters is practically unchanged. Small gains occurred in the number of crucible and noncrucible furnaces.

How Foundries Rank in Size and Operating Practice

	United States	Canada	Total
NUMBER OF FOUNDRIES	5,387	551	5,938
SIZE OF FOUNDRIES:			
Employing over 2,500	12	...	12
Employing 1000 to 2499	45	...	45
Employing 500 to 999	116	10	126
Employing 250 to 499	250	17	267
Employing 100 to 249	583	44	627
Employing 50 to 99	750	93	843
Employing 20 to 49	1,196	132	1,328
Employing less than 20	2,435	255	2,690
TYPE OF METAL CAST:			
Gray Iron	2,591	363	2,954
Malleable	121	16	137
Steel	404	36	440
Brass and Bronze	2,376	284	2,660
Aluminum	2,602	313	2,915
Magnesium	176	13	189
Other Metals	339	36	375
Exclusive Nonferrous	2,330	168	2,498
Nonferrous Departments	910	196	1,106
MELTING EQUIPMENT:			
Cupolas	3,912	545	4,457
Capacity (tons per hour)	34,109	3,158	37,267
Open Hearths	151	17	168
Capacity (tons per charge)	3,775	1,290	5,065
Converters	25	2	27
Capacity (tons per charge)	72	4	76
Air Furnaces	227	16	243
Capacity (tons per charge)	5,848	364	6,212
Electric Furnaces	1,816	154	1,970
Capacity (lb per charge)	1,835,739	460,680	5,296,419
Crucible Furnaces	12,088	975	13,063
Capacity (lb per charge)	6,043,720	416,789	6,460,509
Reverberatory	883	60	943
Capacity (lb per charge)	2,720,105	296,860	3,016,965
Noncrucible Furnaces	1,149	39	1,188
Capacity (lb per charge)	1,332,585	28,910	1,361,495
CASTING METHODS:			
Sand	4,886	534	5,420
Permanent Mold	598	59	657
Die Casting	143	15	158
Centrifugal	205	16	221
Plaster Mold	146	15	161
Investment Mold	107	6	113
Shell Mold	188	9	197

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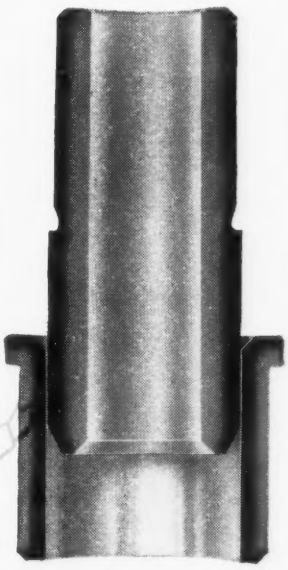

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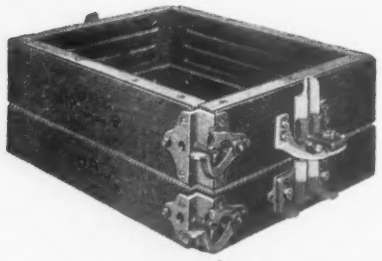
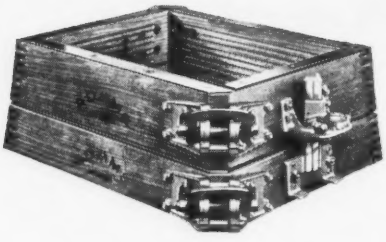
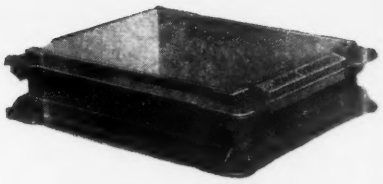
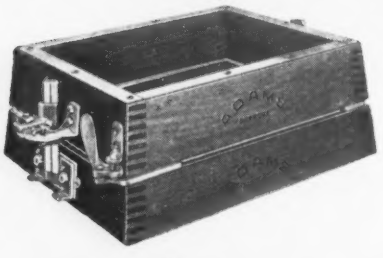
175

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN



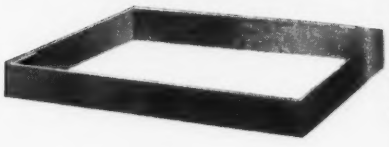


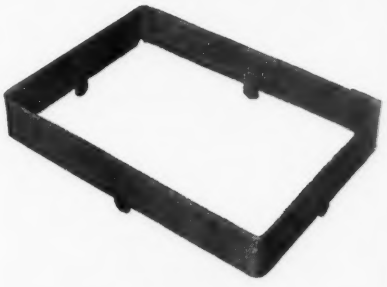


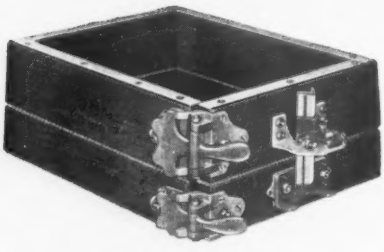


ADAMS

FLASK EQUIPMENT





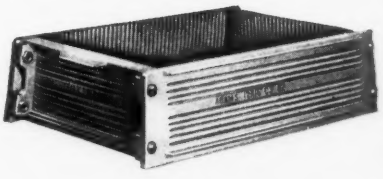


Cherry Snap Flasks

Cherry Easy-Off Flasks

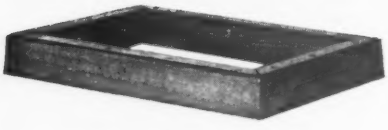
Aluminum Slip Flasks

Aluminum Easy-Off Flasks



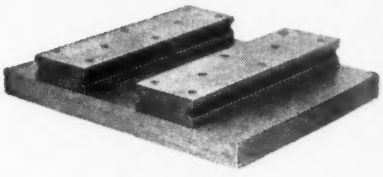
Cherry Upsets

Aluminum Upsets



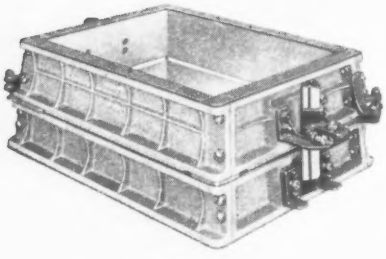
Cast Iron or Aluminum Jackets

Steel Jackets

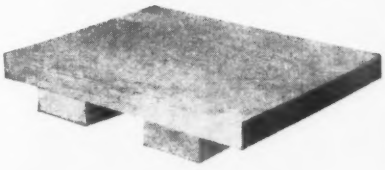


Cherry Presser Boards

Wood Bottom Boards

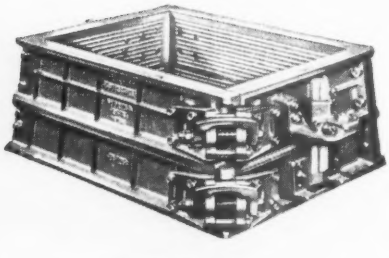


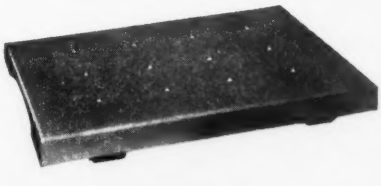
Steel Bottom Plates,
No. 1 and No. 2



Steel Bands

Steel Upsets





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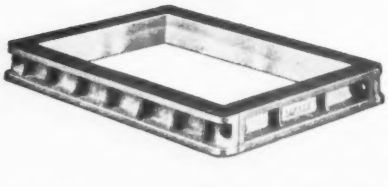

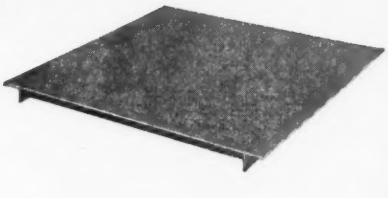

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MOLDING MACHINES and FLASK EQUIPMENT

Follow Boards and Matchplates (III)

ABC of Foundry Practice

By PAT DWYER, *Engineering Editor*

VARIOUS materials are used for making matchplates and follow boards in the foundry. These include proprietary compounds made by several manufacturers. Some of this material is supplied in loose bulk and is manipulated like molding sand. Another variety is supplied as a powder to be mixed with water. Both kinds become hard and firm a short time after they have been given the required shape.

A mixture used for follow boards, also known as odd sides, includes: Portland cement two parts; plaster of paris one part; sharp sand one part. A more permanent mixture contains asphalt 74 lb; plaster of paris 24 lb; plumbago 2 lb. The familiar sand match is made up according to several formulas depending on local conditions and personal preference. The following is typical: Finely sifted gangway sand 89 parts; fine iron borings 1 part; litharge 3 parts. This is mixed in the dry state and sufficient linseed oil is added to dampen the mass. Usually a little water is needed to render the combination readily workable.

The manufacturer of one proprietary compound also furnishes malleable iron pattern frames ½-in. thick with pins and pin holes and countersunk screw holes. The frame has an undercut bevel that overlaps the edges of the composition and binds it firmly to the plate or pattern board. Frame and board receive all the rapping, handling, etc., and protect the pattern from strain and abuse. It is claimed that patterns mounted in this manner last from five to ten times as long as similar patterns unmounted or handled simply as units. The system is applicable to wood or metal patterns.

One side of the pattern first is molded in composition with parting line and runner. A transfer of this drag match is made in composition to serve as a cope match. Then the pattern is set back in the first impression and fastened rigidly with suitable screws. It is not necessary to make a preliminary sand mold. There is no sand to clean off after the match is finished.

For example, take a small pulley pattern. The drag frame is secured to the board by an intermediate wood frame designed to bring the iron frame in proper relation to the parting line. The pattern should rest level on end-grain, shellacked wood blocks to allow about ½-in. composition below the lowest point on the pattern.

The pattern is attached firmly to the pattern board by several long screws which pass through the supporting wood blocks and enter drilled and tapped holes in the metal pattern. Small wedges are useful in locating the pattern on the blocks in a manner to insure a clean vertical draw. After mixing a sufficient quantity, the composition material is tucked and rammed under and around the pattern until the frame is filled. The parting is made as in ordinary sand practice.

After the parting is made the pattern is unscrewed and removed. The small wood blocks remain in the composition. The parting is gone over carefully and slicked. The match is set away to harden 12 to 24 hours in a dry place and at a temperature of 70 to 80° F. When the drag match is dried, the cope core print is set in loosely for transfer to the cope match. The drag match face is dusted lightly with parting compound shaken from a bag. Tumbler dust may be used for this purpose; it does not absorb oil or stick to the face of a fresh mount.

The cope pattern frame, the frame with the pins, is set on the drag mount and a wood frame of sufficient depth to match the depth of the pattern face is clamped on top. A fresh batch of compound is prepared and rammed in place. Surplus material is struck off and the frame is brushed clean. The cope pattern board is clamped in place, the assembly is turned over and the drag match is removed. The cope match then is set away to harden over night. The pattern is returned to the drag match and attached permanently. It is considered advisable to apply two coats of shellac varnish to the surface of each mount. Between coats the surface is smoothed with fine sandpaper.

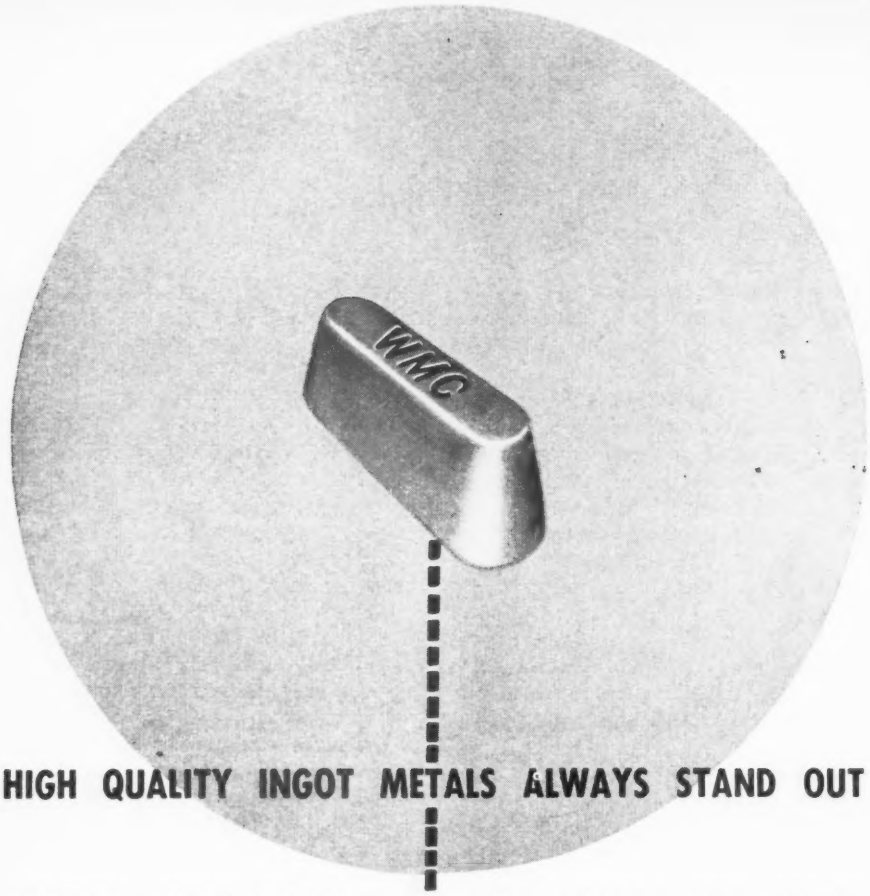
Metal matchplates and gated patterns readily are adapted for use on a two-plate molding machine. It is claimed the method produces a perfectly accurate pair of mounts without injuring or altering the matchplate or card of patterns. Pattern mounts are equally valuable for bench, floor or squeezer molding. In this instance the pattern merely is set, not fastened into the drag match and no cope is required.

The Follow Board—One of the oldest devices in the foundry for increasing production, and one that still is used extensively, is the follow board, also known colloquially in many places as a fallow board, an odd side, a match, a matchplate, a sand match, a plaster match, or a false cope. Local custom has perpetuated any one of these terms in any given locality. Of course, some of the terms are based on the material composing the device. As with many other terms employed loosely in the foundry, this group of terms referring to a follow board is synonymous and interchangeable.

The device is designed to take the place of the rollover board and is particularly applicable to single patterns or groups of small patterns requiring an irregular parting line. Where a pattern or group of patterns of this kind is placed on a flat board and rolled over in a drag, a considerable amount of time is consumed in removing the surplus sand and in forming the irregular parting surface. Manifestly, if the operation has to be repeated on every mold made during the day, the amount of time consumed amounts to quite an item. The follow board automatically forms the parting surface on the drag and in that manner relieves the molder of the necessity of doing that amount of work.

A wood, composition or metal matchplate for use either on the bench or on a molding machine performs the same function. Any one of various reasons may lead a foundryman to choose a follow board of any material in preference to a matchplate, or vice versa. These reasons usually hinge on local conditions, available equipment, extent of an order, etc. The following brief description is confined to the methods and materials employed for many years in a midwest malleable iron foundry.

In some respects the fire clay follow board resembles a soft, or green sand match—that is, a follow board formed by ramming green sand in a loose frame, or in a spare cope. This



HIGH QUALITY INGOT METALS ALWAYS STAND OUT

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An ingot is not very large in comparison with the bulk of the melt, but the quality of the ingot determines the quality of the melt. Here at WESTERN we devote more attention to quality than we do to production, because after all that is what we have to sell: quality and service. We produce the following quality ingot metals: BRASS • BRONZE • ALUMINUM • NICKEL • SILVER • DAIRY METAL • ALUMINUM BRONZE • SILICON BRONZE • SPECIAL ALLOYS. If you're in a hurry, we provide special delivery service on complete stocks of standard BRASS, BRONZE and ALUMINUM ALLOYS. Moreover, you may avail yourself of our complete laboratory service as well as experienced field metallurgists to help you produce the exact quality castings you require.

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device usually is employed only when a few duplicate molds are required. It is referred to here to distinguish it from the much more substantial hard sand match, a frame rammed full of a mixture containing sand, linseed oil and litharge. The hard sand match becomes dry and hard and will stand extended service. In this respect, for purpose of classification, the hard sand match may be listed with compounds, proprietary and otherwise, employed in the foundry for the same purpose.

The frame of the clay follow board 12 x 16 in. is made up of four 2 x 2 in. wood strips fastened to a wood bottom board. Metal might be substituted for wood, but since some of these follow boards have been in existence for many years, it would seem that wood is sufficiently durable. Flask guides at each end of the frame are adjustable to compensate for any slight expansion or contraction of the frame under varying conditions of moisture and temperature.

So long as the follow boards are in active daily service no adjustment is necessary. Occasionally a follow board may be retired to storage for a considerable period. Here the moisture evaporates from both clay and wood. Naturally a little adjustment may be required in the guides when the follow board first is returned to active service.

In this respect, indefinite life and usefulness, even though subjected to the usually wrecking influence of intermittent operation, the fire clay follow board seems to present an advantage. As with the desert which under the influence of irrigation blossoms like the rose, so the neglected clay follow board, disreputable and disfigured by large, gaping cracks, once more assumes its smooth, sleek surface when treated to a bath. The clay absorbs the water at any stage of its existence and becomes as plastic and workable as when first pressed into service.

This feature, retention of plasticity over an indefinite period, is taken advantage of in another way. When a pattern becomes obsolete, or is taken out of production for any other reason, the follow board is not thrown away or destroyed. On the contrary, the clay is moistened and reworked to fit another pattern.

Occasionally, orders for different castings overlap to such an extent that it becomes necessary to group two or more varieties of patterns on one follow board. A change of this kind may be accomplished in an hour. No delay is experienced waiting for the clay to dry and harden. The instant the follow board leaves the patternmaker's hands it is in condition

for the molder to use. The clay is neither hard nor soft, but rather resilient and firm, the ideal condition to meet the pressure of the sand forced against it under the head of a molding machine. The drag part of the mold is squeezed on the follow board. The cope part is squeezed against the drag. The two parts are separated by only a thin film of parting compound. In the majority of instances a sharp eye is required to discern any trace of a parting line on the resulting castings.

Method of preparing one of these clay follow boards corresponds almost exactly to the method pursued by a molder in bedding a pattern in the sand either in a flask or in the floor. The clay first is prepared by adding a little water and a still smaller quantity of crude oil. The amount of water is just sufficient to render the clay workable. This means that it is damp but not wet. The oil removes the stickiness to some extent and also retards the evaporation of the water. If the face of the follow board is sprayed occasionally with water, rubbed with a damp sponge and covered with a damp cloth when not in use, it will present a perfect working surface indefinitely.

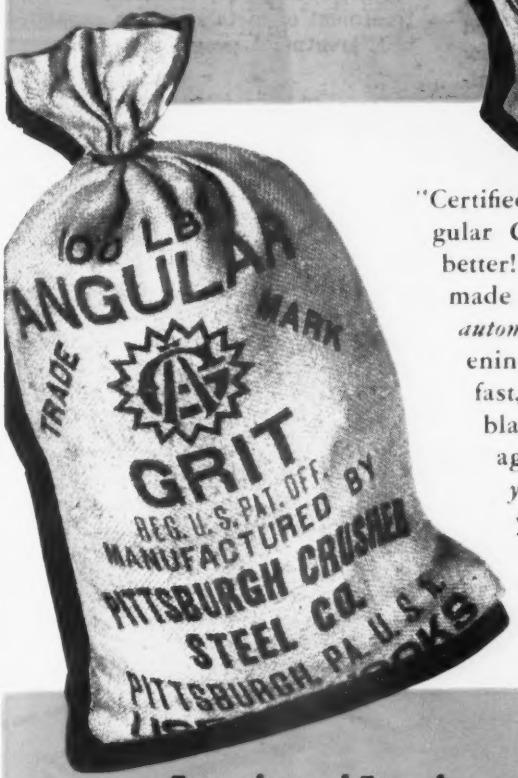
The frame is filled with the prepared clay, pounded into place with a mallet and then scraped off flush with the contact face of the frame. The gate of patterns is placed temporarily on the flat surface and adjusted to show an approximately equal margin at the sides and ends. The outline of each pattern is scribed on the clay and the pattern is removed. The patternmaker removes a sufficient amount of clay to correspond approximately to one half of the bulk of the pattern. He loosens up the clay in the bottom of the excavation and then returns the oiled pattern. With the aid of a block of wood and a mallet he raps the pattern down into the soft clay. The distance the pattern is rapped down depends on the parting line. Where a pattern is symmetrical it is rapped down to a point where a straightedge resting on the sides or ends of the frame will coincide with the center line of the pattern.

After the patternmaker has satisfied himself that the pattern is located properly in regard to the proposed parting line, he rams clay under and around it precisely after the manner of a molder ramming sand around a pattern under similar circumstances. He then removes the surplus clay, sleeks the surface flat wherever possible, and sleeks the remainder smooth along the parting line of the pattern or patterns.

(To be continued)

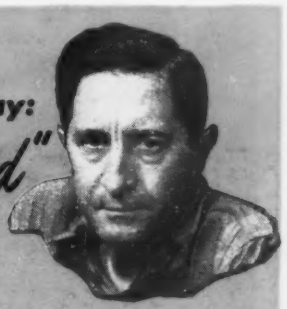
CERTIFIED ABRASIVES

CLEAN and CLEAN and CLEAN and CLEAN!



"Certified" Samson Shot and Angular Grit wear longer, clean better! That's because they're made *extra-tough* by a special *automatically controlled* hardening process that assures you fast, efficient, high-quality blast cleaning over and over again. Try "Certified" in *your* cleaning room and you will discover why it is the *first choice* in hundreds of foundries.

All sizes graded to SAE specifications.



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STEEL SHOT AND GRIT CO.
Boston, Mass.

Industry Briefs

CRAMET INC., wholly owned subsidiary of Crane Co., Chicago, has placed a contract for construction of a $25 million titanium plant, tentatively to be located near Nashville, Tenn. Partial production is scheduled for 1954, with full production to be a year later. Estimated output is 6000 tons, a large part of which will go to the U. S. Air Force. Crane expects ultimately to use the metal in special valves and fittings.

* * *

James B. Clow & Sons, Chicago, has purchased Automatic Heating & Supply, formerly a division of Weil-McClain Co., Chicago, and has moved personnel and inventory to Clow headquarters at 201-299 North Talman, Chicago. Automatic Heating will retain its name and be operated as a department of Clow's jobbing division.

* * *

American MonoRail Co., Cleveland, has established four division offices as follows: Philadelphia, under W. P. Conway, manager; Cleveland, under Frank L. Bateman, manager; Detroit, under C. L. Fell, manager, at Royal Oak, Mich.; Chicago, under C. E. Barner, manager, at Park Ridge, Ill.

* * *

General Electric Co. will add a 70,000-sq-ft metallurgical development laboratory to its multimillion dollar research laboratory at the Knolls, near Schenectady, N. Y. Construction is expected to start shortly, and the building is scheduled for completion by the spring of 1955. GE hopes the new structure will provide facilities that will pave the way for revolutionary metallurgical developments.

* * *

E. F. Houghton & Co., Philadelphia, is planning an increased research program, including a further addition to its laboratories, particularly aimed at a new approach to cutting fluids for modern machine tools, further study of chemical surface treatment of metals and an expanded heat treatment program.

* * *

Dow Chemical Co. will formally dedicate its new $2,600,000 research center at Freeport, Tex., to Dr. William Reed Veazey, recently retired Dow director and research consultant. To be dedicated this month, the 69,000-sq-ft center will house the organic, chemical engineering and electrochemical research of the firm's Texas division, as well as the analytical laboratory.

* * *

Ford Motor Co. will build a new engine plant for the production of Ford V-8 car and truck engines adjacent to its present engine plant and foundry in Brookpark Village, a Cleveland suburb. Expected to be in operation early in 1955, the new plant will employ 3000 persons, and about 1000 more will be added to the payroll of the foundry, which will supply most of the castings needed in the new plant.

* * *

Lewis Casting Co. Inc., Lewiston, N. Y., formerly producer of aluminum and bronze castings, is now devoting entire capacity to manufacturing of riser insulating sleeves (sizes from 1 to 6 in. ID) for steel, iron, bronze and aluminum foundries, made of mineral perlite. Recently work was completed on insulating brick made of the same material, weighing slightly over 2 lb each for a 9-in. straight brick, strong enough to support over 200-lb weight.

* * *

Chicago Pneumatic Tool Co., New York, has acquired Jacobs Mfg. Co., West Hartford, Conn., manufacturer of chucks. Operations of the latter will be carried on without change in company name.

* * *

Continental Industrial Engineers Inc., 176 West Adams St., Chicago 3, has concluded an agreement with Italforni S.p. Az., 4 A Via Malta, Genoa, Italy, for the sale and construction engineering of industrial furnaces, ovens and complete production lines.

* * *

Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, has been named exclusive distributor in the United States for a line of dust measuring instruments manufactured by C. F. Casella & Co., London.

* * *

Armstrong Whitworth & Co. Ltd., Tynemouth, England, a subsidiary of Thor Power Tool Co., Aurora, Ill., began production recently at a newly constructed plant after the entire former factory at Newcastle had been transported 10 miles. The new plant has 50 per cent more manufacturing space.

* * *

Frederic B. Stevens Inc., Detroit, has opened a customer service warehouse in Springfield, O. It will be operated in conjunction with the company's plant in Springfield.

* * *

Superior Die Casting Co., 1001 London Rd. Cleveland, is adding 6600 sq ft to its plant.

* * *

Vanton Pump Corp. has changed its name to Vanton Pump & Equipment Corp., in line with its addition of new products to the company line. The firm's manufacturing plant has been moved from its Long Island City, N. Y., location to a new build-

(*Concluded on page* 203)

ENLARGE FOUNDRY: Floor area of the Morris Bean & Co. aluminum foundry, Yellow Springs, O., will be increased to 88,000 sq ft by an addition now under construction. The new area, shown with the gray roof in this view, will be in full production by January, 1954. Maximum capacity will be increased by 60 per cent, and about 100 new employees will be required to maintain projected operating schedules. The firm is also increasing the capacity of its nodular iron foundry at Cedarville, O.

Greater hourly capacity than any other muller!

THE NEW "80A" SPEEDMULLOR

The New "80A" Speedmullor Mulls MORE Sand Per Hour To Its Maximum Physical Properties Than Any Other Muller . . . Increasing the Margin of Superiority Already Enjoyed By The "80" Speedmullor!

Redesigned crosshead . . . the ultimate in simplicity . . . provides cleaner operation and improved cooling! Streamlined plows mounted at optimum lift angles for maximum mulling efficiency. Plows and wear plates coated with extra hard abrasion resistant material. All plow parts subject to wear are bolted for easy replacement.

Removable transmission unit for ease of maintenance. Directed force-feed lubrication for longer drive unit life. Involute pump integral part of transmission.

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Here's why more foundries use

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Once loaded, the Mulbaro's barrow is placed beneath the mulling mechanism which is then lowered into position. Mulling is completed in *four minutes* or less, and the sand is ready for delivery anywhere in the foundry. There's no time wasted in loading or unloading. The barrow serves not only as a mulling pan during the mulling cycle, but as the transportation medium . . . and sand container for the molder or coremaker if desired.

Small foundries save money by using a Mulbaro for mulling *all* of their sand. Large foundries find that the Mulbaro pays for itself in a very short time in mulling special facing or core sands.
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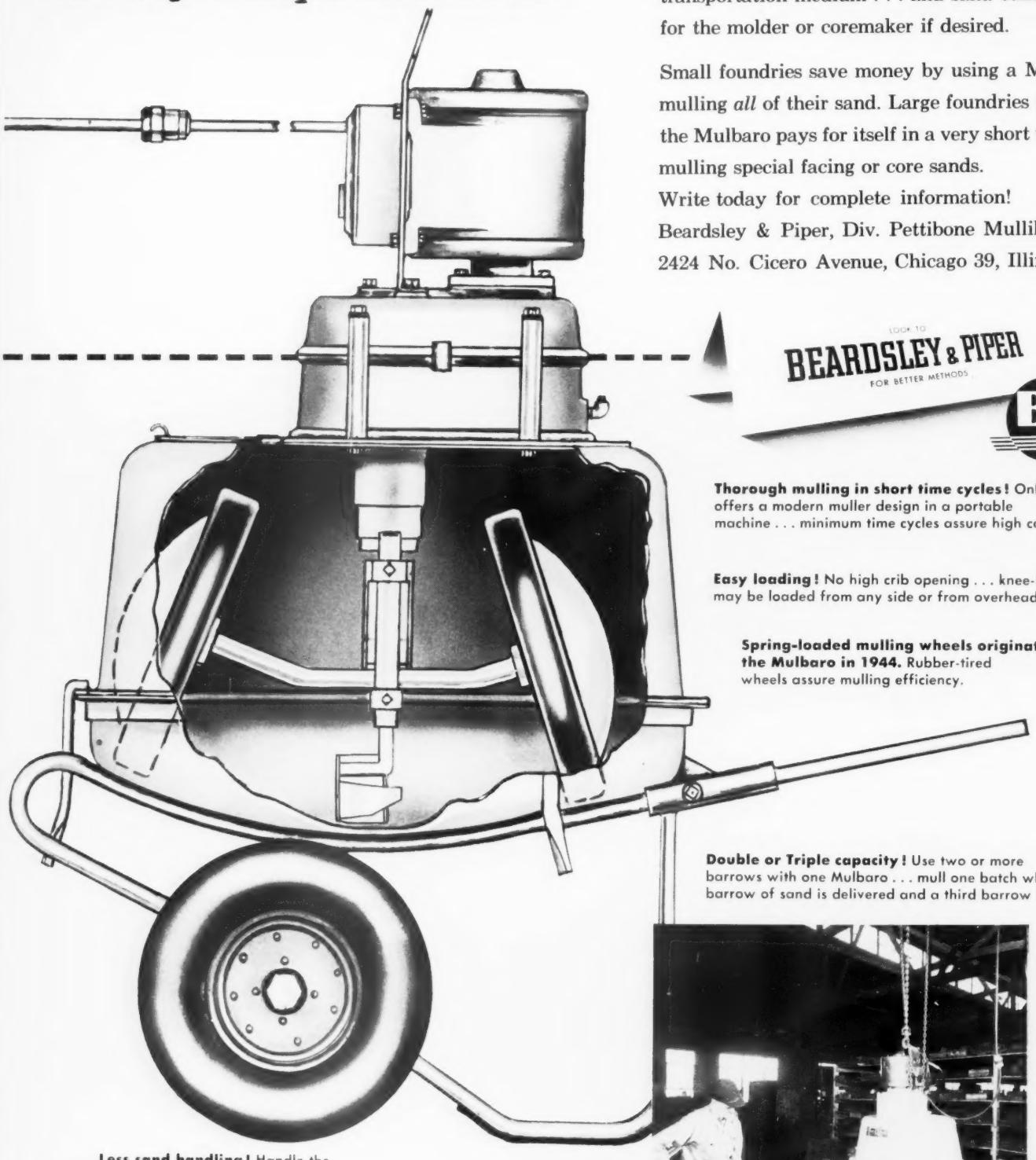

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FOR BETTER METHODS

Thorough mulling in short time cycles! Only the Mulbaro offers a modern muller design in a portable machine . . . minimum time cycles assure high capacity.

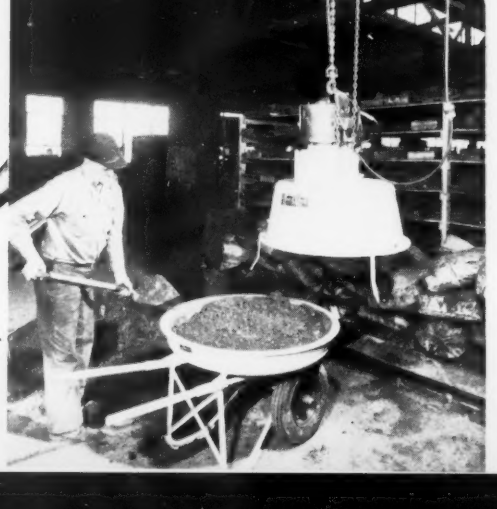
Easy loading! No high crib opening . . . knee-high barrows may be loaded from any side or from overhead hopper.

Spring-loaded mulling wheels originated with the Mulbaro in 1944. Rubber-tired wheels assure mulling efficiency.

Double or Triple capacity! Use two or more barrows with one Mulbaro . . . mull one batch while a second barrow of sand is delivered and a third barrow is loaded.

Less sand handling! Handle the sand **once** when it's loaded for mulling . . . then deliver it to molder or coremaker in the same barrow.

Really portable! Move the sand . . . not the whole machine.



(*Concluded from page* 200)

ng on the premises of its affiliate company, Cooper Alloy Foundry Co., Hillside, N. J. Executive and sales offices remain at the Empire State Bldg., New York 1.

* * *

Baker-Raulang Co., Cleveland, has appointed the following representatives for its line of industrial trucks and cranes: Baker-Lull Associates, 25 South Easton Rd., Glenside (Philadelphia), Pa., for eastern Pennsylvania and southern New Jersey; Hohl Industrial Sales Co., 2603 Main St., Buffalo, for eastern New York; A & W Engineering Co., 2222 Northwest Fourteenth St., Miami, Fla., for southern Florida; and Chapman Machinery Co., 210 Thirteenth St., Tampa, Fla., for central Florida.

* * *

Arcair Co., Bremerton, Wash., has opened an eastern sales and distribution office at 423 South Mount Pleasant Ave., Lancaster, O. The eastern division will maintain a warehouse and a permanent office and sales staff. Arcair manufactures a metal cutting and gouging torch.

* * *

Cedar Heights Clay & Coal Co., Oak Hill, O., has changed its name to Cedar Heights Clay Co.

Malleablization

(*Continued from page* 109)

cleation-and-growth reactions, and they therefore require time for their completion. This time for reaction in general varies with the reaction temperature, in the same way that the reactions to form proeutectoid ferrite, pearlite, and bainite by the transformation of austenite in steel vary with temperature.

It has been found extremely useful to plot transformation diagrams (S-curves or TTT curves) for the pearlite, bainite, and other reactions in

(*Continued on page* 205)

Meetings of Interest to Foundrymen

Oct. 8-9—Gray Iron Founders' Society, annual meeting, New Hotel Jefferson, St. Louis

Oct. 8-9—Michigan Regional Foundry Conference, Kellogg Center, Michigan State College, East Lansing, Mich.

Oct. 8-9—American Society for Quality Control, eighth midwest conference, Masonic Temple, Davenport, Iowa

Oct. 15-17—Foundry Equipment Manufacturers' Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 16-17—Northwest Regional Foundry Conference, sponsored by Oregon, Washington and British Columbia Chapters, AFS, New Washington Hotel, Seattle

Oct. 16-17—Malleable Founders' Society, personnel conference, General Brock Hotel, Niagara Falls, Ont.

Oct. 17-20—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 19-21—American Institute of Mining and Metallurgical Engineers, Institute of Metals Division, fall meeting, Allerton Hotel, Cleveland

Oct. 19-23—National Safety Council, national safety congress and exposition, Chicago

Oct. 19-23—American Society for Metals, national metal congress and exposition, Public Auditorium, Cleveland

Oct. 23-24—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 23-24—National Noise Abatement Symposium, Illinois Institute of Technology, Technology Center, Chicago

Oct. 29-30—Metal Castings Conference, sponsored by Purdue University, Michigan and Central Indiana AFS chapters, Purdue University, West Lafayette, Ind.

Nov. 4-6—Steel Founders' Society of America, T & O Conference, Carter Hotel, Cleveland

Nov. 4-6—Industrial Management Society, annual time and motion study and management clinic, Sheraton Hotel, Chicago

Nov. 4-6—Meehanite Metal Corp., annual research meeting, Hotel Cleveland, Cleveland

Nov. 5-6—Annual Pittsburgh Diffraction Conference, Mellon Institute, Pittsburgh

Dec. 3-5—American Institute of Mining & Metallurgical Engineers, electric furnace steel conference, Netherland-Plaza Hotel, Cincinnati

1954

Jan. 22—Malleable Founders' Society, general society meeting, Hotel Cleveland, Cleveland

Jan. 25-28—Plant Maintenance & Engineering Show, International Amphitheater, Chicago. The **Plant Maintenance & Engineering Conference** will be held concurrently at the Hotel Conrad Hilton, Chicago

Feb. 1-5—American Society for Testing Materials, committee week, Hotel Shoreham, Washington, D. C.

Feb. 11-12—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee

Feb. 18-19—Southeastern Regional Foundry Conference, Patten Hotel, Chattanooga, Tenn.

Mar. 10-11—Foundry Educational Foundation, annual conference of advisory committees and annual meeting, Hotel Cleveland, Cleveland

Mar. 15-19—National Association of Corrosion Engineers, tenth annual conference and exhibition, Kansas City

Mar. 16-17—Steel Founders' Society of America, annual meeting, Edgewater Beach Hotel, Chicago

Apr. 5-7—American Institute of Mining & Metallurgical Engineers, national open hearth conference, Palmer House, Chicago

Apr. 8-9—Malleable Founders' Society, market development conference, Pittsburgh

May 4-7—American Welding Society, national spring technical meeting, Hotel Statler, Buffalo

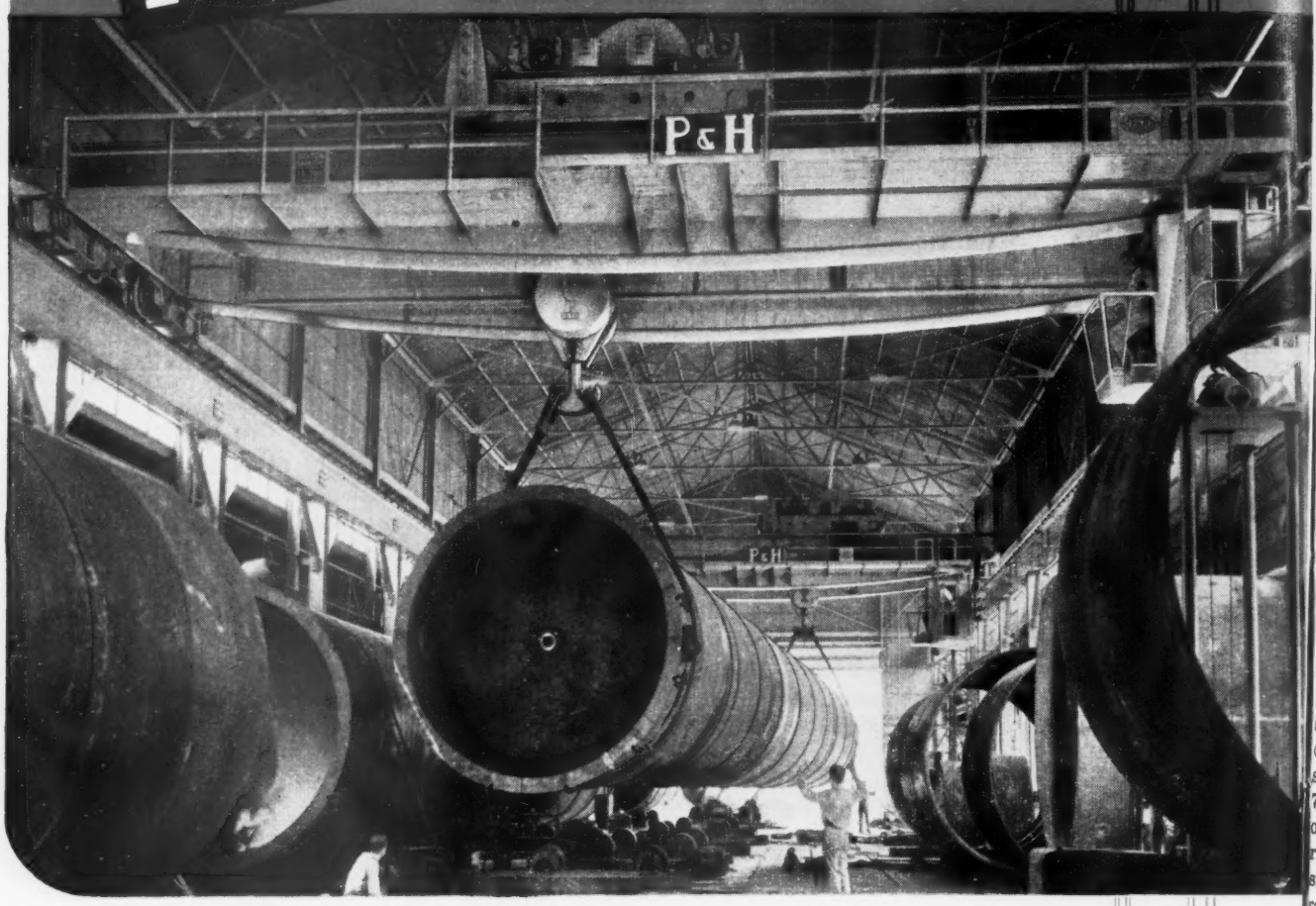
May 5-8—American Welding Society, welding and allied industry exposition, Buffalo Memorial Auditorium, Buffalo

May 8-14—American Foundrymen's Society, annual convention and exhibition, Public Auditorium, Cleveland

June 14-15—Malleable Founders' Society, annual meeting, Seigniory Club, Province of Quebec, Canada

June 14-18—American Society for Testing Materials, annual meeting, Hotels Sherman and Morrison, Chicago

P&H OVERHEAD CRANES



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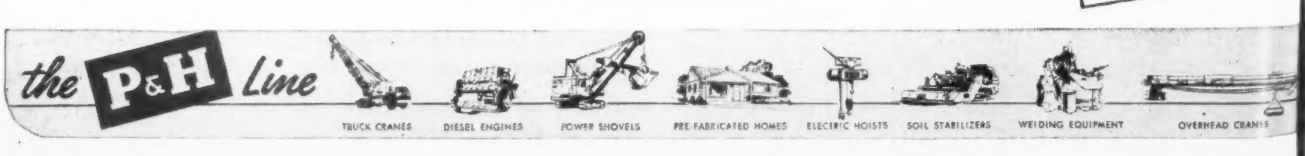

(*Continued from page* 203)

steel, using isothermal reactions even though most transformations which actually take place in practice do so at cooling conditions far removed from isothermal.

Following the same procedure, a transformation diagram has been drawn in Fig. 2 to indicate the kinetics of the reactions which can take place in second-stage malleablization. This diagram consists of three semi-independent branches, the stable eutectoid transformation, the pearlite reaction, and the (subcritical) graphitization of pearlite. The stable eutectoid transformation may be written:

austenite → ferrite plus graphite, I

the pearlite reaction as:

austenite → ferrite plus cementite II

and the graphitization of the cementite of pearlite as:

cementite → ferrite plus graphite III

The stable eutectoid transformation is indicated in Fig. 2 by the upper band enclosed by solid lines, the pearlite reaction by the band enclosed by broken lines, and the graphitization reaction by the lower band or cups enclosed by solid lines.

The diagram can be best understood by considering the behavior of our alloy which has undergone first stage malleablization, has cooled to 765° C (1409° F), thus consisting of austenite plus graphite, and is then rather quickly cooled to selected constant reaction temperatures. If the reaction temperature is held at some value between 750° and 765° C (1382 and 1409° F), let us say 758° C (1396° F), when the time curve crosses the solid line in Fig. 2, indicating the beginning of transformation, austenite begins to transform to ferrite plus graphite.

Now the second line of the stable eutectoid transformation branch, which indicates the end of reaction, is never crossed at a temperature above 750° C (1382° F), which is another way of saying that the reaction never goes to complete elimination of austenite. This is in accord with the 758° isotherm of Fig. 1A, which shows the equilibrium structure to contain austenite (as well as ferrite and graphite). If, however, the reaction temperature had been somewhat lower, as shown by the arrow through *ab*, the transformation commences at time *a* and is complete at time *b*. This is the direct mechanism for second-stage malleablization.

If the reaction temperature is lower still as at *gh*, the austenite transforms not to ferrite plus graphite but rather to pearlite, beginning at time *g* and completing at time *h*. This produces a pearlitic matrix iron. If the reaction temperature is at an intermediate value (at *cd*), the stable eutectoid reaction commences at time *c*, but before it has a chance to completely transform the iron to a ferritic matrix, the pearlite reaction interrupts to transform the remaining austenite. For reasons of diffusion geometry the reaction at *c* deposits ferrite in the form of spherical shells around the graphite nodules, and the pearlite in turn surrounds the ferrite, giving rise to the "bull's eye ferrite" structure.

The pearlite, once formed, is not wholly stable and its cementite will eventually decompose to graphite plus ferrite, as written in Reaction III and illustrated by the cusp in the lower right of Fig. 2. Thus the pearlite of the "bull's eye" structure will commence to decompose at *e* and the matrix will be completely ferritic at *f*; similarly the pearlite formed at *gh* will decompose along *ij*.

TABLE I—CHEMICAL ANALYSES OF IRON

	A	B	E
Silicon	1.59	1.22	0.96
Sulphur	0.161	0.08	0.156
Phosphorus .	0.03	0.15	0.121
Manganese .	0.48	0.29	0.40
Total carbon.	2.34	2.28	2.60
Mn/S	3	3.6	2.6
Chromium.	(not reported)	(not reported)	0.033

Here are then the two mechanisms for forming a ferritic matrix: (1) *ab* the direct transformation and (2) *cd* plus *ef* or *gh* plus *ij*, the two-step mechanism, and either may conceivably operate in practice. If a few carbide particles are seen remaining from incompletion of Reaction III, at least part of the process can be said to have occurred by the two-step mechanism. Otherwise the end products of the two are both ferrite and graphite, in both instances the eutectoid graphite deposits largely upon existing graphite nodules, and it is accordingly not possible to determine from an examination of the finished ferritic product which mechanism was responsible.

Experimental Procedure — Because of the conflicting views expressed in the contemporary literature on the question of which mechanism actually takes place in practice, a standard blackheart malleable anneal was performed on three commercial irons with temperature, atmosphere, sampling, and metallographic specimen preparation under rigid control. These irons (Table I) were procured in the form of standard hard iron tensile test bars with barrel diameters of approximately ⅝-in. From the barrel of a single bar of each of the three irons, equivalent specimens were cut approximately 0.15 x 0.15 x 0.3 in. These were annealed in a commercial heat treating salt at the bottom of an iron tube, which was itself immersed 6 in. in a lead pot thermostat. Salt

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was used to surround the specimen because although the lead itself does not affect the system, the hydrogen reduced from water in the carbonaceous cover usually used to cover lead baths strongly inhibits the graphitization reactions.[1] The temperature was regulated by a controller equipped with a geared heating and cooling-rate device.[2]

The specimens, charged cold, were heated in six hours to 782° C (1440° F), held two hours, and further heated to 920° C (1688° F) in one hour. They were held at 920° C for 22 hours, cooled at 15.9° C/hour (28.6° F/hour) to 760° C (1400° F), and further cooled at 1.8° C/hour (3.2° F/hour) for the remainder of the anneal.

Specimens were withdrawn, quenched, prepared metallographically, and examined with care; the microconstituents found in them are listed in Table II. (In this table "M" indicates martensite, which was austenite before the quench, and "F" indicates ferrite.)

In no instance did pearlite or carbide appear, but rather the austenite transformed directly to ferrite plus graphite as previously mentioned.

The fact that these three irons in this annealing cycle underwent the direct mechanism does not, of course, demonstrate that *all* commercial ferritic malleable irons form in this way. It does, however, demonstrate that at least some of them do so, and the author has not seen any evidence to indicate the extent, if any, that the two-step mechanism takes place in practice.

Discussion—The three branches of the transformation diagram of Fig. 2 can be displaced relative to each other and relative to the time axis (though not in a wholly independent fashion) by suitable alloy additions. The curve for direct transformation (Reaction I) is, for example, displaced far to the right by hydrogen (supplied by annealing in a hydrogen-bearing gas), while the pearlite curve is virtually unaffected; the net effect then is to uncover the pearlite curve so much that the pearlite reaction takes place instead of the direct transformation. Since pearlite then forms at higher temperatures, the peak of the pearlite graphitization cusp rises to a higher temperature, but because of hydrogen the graphitization reaction is also delayed and the cusp is moved far to the right.

TABLE II—METALLOGRAPHIC SPECIMENS

Specimen No.	Quenching Temperature °F	Quenching Temperature °C	Microstructure (in addition to graphite) Iron A	Iron B	Iron E
1	1425	773	M	M	M
2	1395	757	M	M + F	M
3	1393	756	M + F	M + F	M + F
4	1380	749	M + F	M + F	M + F
5	1368	742	M + F	M + F	M + F
6	1353	734	M + F	F	M + F
7	1323	717	F	F	F

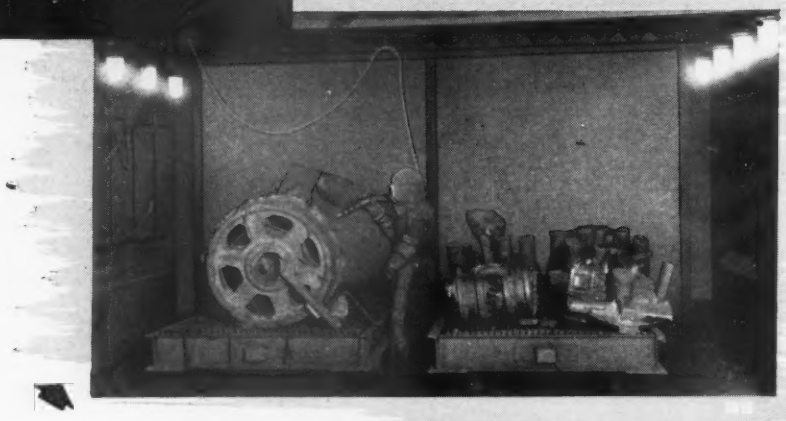
Let us next consider the problem of optimum Mn/S ratio in terms of Fig. 2. The best available data on the effect of this ratio on the rate of second-stage malleablization show that the minimum annealing time is afforded by adjusting the manganese in accordance with the formula

$$\% \text{ Mn} = (1.7 \times \% \text{ S}) + 0.15.^{3}$$

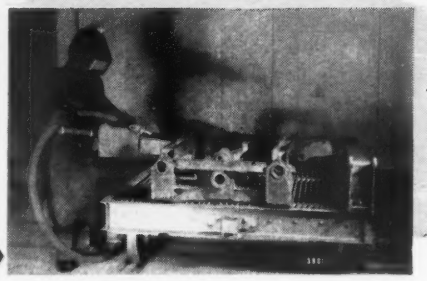
This well attested relation refers not to Reaction I nor to Reaction II plus III, but to Reaction III alone. Manganese has the highest hardenability factor of the elements commonly used in alloy steels, indicating that it strongly moves the pearlite curve to the right; it also moves the direct transformation curve to the right— farther even than the pearlite curve—so that high-manganese irons transform to pearlite only.

The formula for optimum Mn/S ratio is based on a minimum value of *ij*, the breadth of the pearlite graphitization cusp at a selected temperature, and although adding manganese when below this optimum ratio speeds up Reaction III, it slows down Reaction II. This consideration of mechanism

SLY ARMOURED* BLAST ROOMS



A 16′ x 16′ Sly Blast Room with double track for two cars. Both cars can be used for a single large casting. Note how perforated floor plates keep coarse refuse from entering hopper below.



This view shows a Sly Blast Car in a Sly Blast Room. Perforated floor plates are supported by grating preventing plates from warping. Observe how tops of rails are flush with floor. Operator wears a Sly "Purair" Helmet.

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then indicates that for complete second-stage malleablization, *if it takes place by the two-step mechanism,* the optimum manganese content must be somewhat less than the formula calls for. (Unfortunately these aren't enough clues to afford even a guess at how much less this overall optimum value will be.) No information is known on the optimum Mn/S ratio for most rapid second-stage malleablization by direct transformation, but it would be fortuitous (and unexpected) if the value should coincide with the value for the graphitization of pearlite.

This discussion has been based upon the isothermal transformation diagram (the line *ab* is horizontal). The same general form holds true for the case of continuous slow cooling (*ab* sloping down to the right), though the actual curves will be shifted.

The isothermal transformation diagram of Fig. 2 has been constructed from very scant data indeed, and complete kinetic data on second-stage malleablization may show different shapes of the several branches for specific iron. Because pearlite formed at different temperatures varies in coarseness, which in turn causes the graphitization rate to vary, it is possible that in some irons the point of the cusp will actually bend back and give the cusp a C-shape. It is also possible that in some regions the decomposition of pearlite may be found to commence before the austenite has transformed completely to pearlite, which would show the graphitization cusp partially overlapping the pearlite reaction. These are some of the questions which must be answered by experiment.

The present investigation simply shows that the direct mechanism *can* take place in commercial practice and that in assaying the effects of alloying elements and temperature, the possibility of using the direct mechanism must be considered along with the indirect in determining the most economical conditions for second-stage malleablization.

Acknowledgment—This study was a co-operative project between the Malleable Founders' Society and the Department of Engineering Research, North Carolina State College. It is a pleasure to record here the author's appreciation to James H. Lansing, technical and research director of the society and to Prof. N. W. Conner, director of this department, for their support.

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2. Floyd Brown: "A Simple Temperature-Controller Adapter for Controlled Heating and Cooling Rates," Engineering School Bull. No. 3, North Carolina State College.
3. J. E. Rehder: "Effect of Mn/S Ratio on the Rate of Anneal of Blackheart Malleable Iron," *Transactions,* AFS, 56, 138 (1948).

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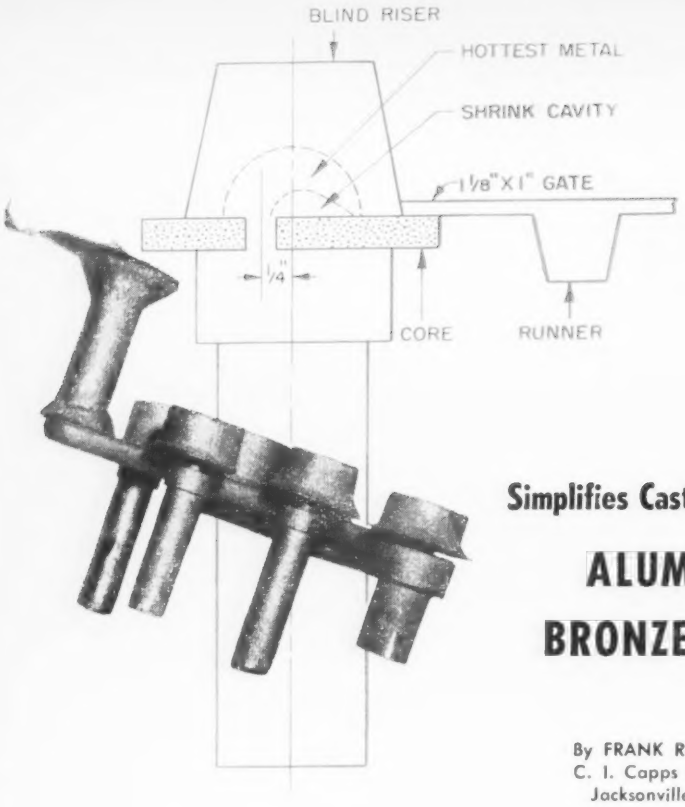

Simplifies Casting of ALUMINUM BRONZE PINS

By FRANK R. CAPPS
C. I. Capps Co. Inc.
Jacksonville, Fla.

Sketch showing arrangement of runner, gate, blind riser and cut-off core in casting the aluminum bronze pins shown in as-cast condition

WE ARE making large quantities of cast aluminum bronze pins to Navy Specification 46-B-18d, Class 4. The original specification was for stainless steel annealed bar stock. This was changed for increased strength, corrosion resistance and better delivery. Our problem was to meet the cost and still do a profitable job.

Aluminum bronze shrinks to about the same degree as steel, and the required risers had to be equal in diameter to the head of the pins—some 1½ and some 2 in. diameter. After the risers were cut off with an abrasive wheel, a considerable amount of grinding remained to get the heads to proper size and radius. In the beginning we used knock-off cores to cut the neck, but we still had the gate removal problem. Furthermore, we could not reduce the neck of the riser to a size where it readily could be knocked off. Aluminum bronze is an exceedingly tough metal.

Then we tried running the gate into the riser. This enabled us to reduce the connection between riser and casting to ¼-in. diameter. When the molds are shaken out now, the pin castings readily are knocked off. No grinding is needed and the small stub from the riser connection is removed during the subsequent machining process. Return scrap is thrown into the furnace without any preliminary trip to the cleaning room. Instead of a loss, the job is yielding a profit.

A 2½-in.-square core, ¼-in. thick with a ¼-in.-diameter hole, ¼-in. off center, is placed in the core print on top of the pin pattern. Pattern and core print are in the drag, with the core print against the pattern plate. The runner also is on the drag side of the plate. The gate is on the cope side of the plate and is connected to the side of each riser. Blind risers also are on the cope side of the plate so that the cope can be squeezed. The molding time is standard for jolt-squeeze work. The foregoing features are shown in the accompanying illustration.

The shrink cavity in the riser is on the bottom next to the cut-off core. We use a smaller riser with this ¼-in. hole than we did when the hole was ¾-in. We attribute this to the fact that the metal flows into the riser and fills it before the casting cavity is filled. The ¼-in. hole acts as a choke and permits the hot metal to do such a thorough heating job on the core, especially the top side, that when the mold is filled, the hottest metal is exactly where it is needed to feed the casting perfectly. The skin next to the heated center of the core is thin and core collapses readily.

By holding metal in the riser, we trap any dross that comes through the gating system. Any material of that kind is held in the riser. As a result the castings are perfectly clean and solid.

Cast Bronze Memorial

(*Continued from page* 107)

tions later are joined permanently. The so-called Roman joint, developed by ancient artificers, still is in use where various parts of a statue are cast separately and afterward are united to present a smooth, unbroken surface.

Adjoining ridges on the male and female joint are hammered down flat so that the metal flows into intimate contact. The resulting joint then is filed and scraped until no joint is visible. In the early days and up to comparatively recent years, rivets or bolts held the joint parts in firm and intimate contact. In recent years the same purpose has been achieved with the welding flame. As with other major and minor tricks of the trade, the basic principle of the Roman joint never has been changed since it first was hit upon by an ingenious metal statue maker.

Because of the wide variety in design which characterizes the patterns in this line of foundry business and because the same casting seldom or never is duplicated, it has been found advisable to provide knockdown flasks that can be assembled in many combinations. In some instances the sides and ends are lengths of steel I-beams bolted at the four corners. The lower edge or flange of the I-beam serves as a sand strip. Chuck bars bolted to the sides and long rods extending from side to side, with the ends tightly wedged in square holes in the I-beam, reinforce the sand and hold it in position. Cope and drag are barred in the same manner since, in the majority of instances, the flask is rolled over twice. On large flasks, steel channel beams, plates or rails are bolted on top of the flask to prevent the same from rising when the mold is filled with metal.

Pattern Is Bedded in False Cope

The cope, face up, is placed on the floor and partly filled with sand. The plaster pattern is adjusted approximately in the center with the natural parting line conforming as nearly as possible with the joint line of the flask. The cope merely serves as a follow board to hold the pattern in place while the drag is rammed full of sand. Exposed part of the pattern is covered with French sand, for many years considered absolutely essential for the purpose. French sand was employed for molding the Marine Corps war memorial castings, but it may be of interest to note that a few years ago a prominent eastern sand supply firm developed a special American sand mixture for which the

(*Continued on page* 210)

CORE CAPACITY INCREASED 125% with DESPATCH CONVEYORIZED CORE BAKING SYSTEM

Racks carrying baked cores are shown descending from the oven to unloading zone on core room floor.

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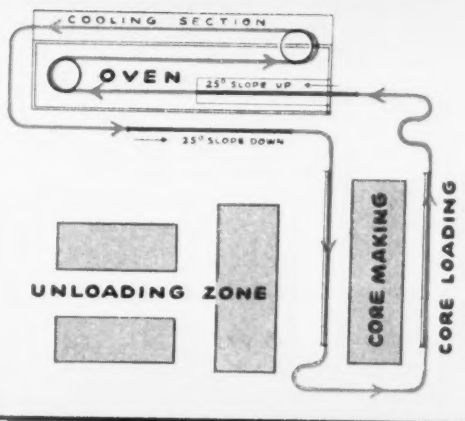

This schematic drawing shows route of the 480' continuous conveyor from core making and loading area, through baking and cooling zones, to unloading area.

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CURRENT STATUS OF APPRENTICESHIP

In the Patternmaking Industry

By W. F. PATTERSON
Director
Bureau of Apprenticeship
U. S. Department of Labor
Washington

ONE point on which labor and management are in general accord today, regardless of differences resulting from personal viewpoints on procedures, is apprentice training. As a result, apprenticeship in this country is stronger, more widely accepted, and of better quality than it has been at any other time in our history.

You of the patternmaking industry represent one of the most critical and most basic of all defense occupations. Your skills are required during the first stage of production of many of the items used in our defense effort. For example, the first step in translating the engineer's blueprint into badly needed machine tools is that of making a pattern.

Unlike some other crafts, patternmaking cannot, in times of emergency, be broken down into component parts and subdivided into jobs of lesser skills. This means that we must expend every effort to provide defense industries an adequate supply of skilled patternmakers. Apprenticeship, as conducted by local Joint Apprenticeship Committees, is the soundest and most economical method of developing these skilled workers.

What is the status of apprenticeship in the patternmaking industry today? Let's take a quick look at a few statistics.

Approximately 15,000 journeymen patternmakers are employed throughout the United States today. As of April 1 of this year, there were 1275 registered patternmaker apprentices.

Let's look a little further.

Statistics show that approximately 2.9 per cent of all those persons engaged in industrial occupations are lost to industry each year through death, retirement, or other causes. Applying this percentage to the 15,000 journeymen patternmakers currently employed, we find that the trade can anticipate losing about 450 skilled patternmakers each year. If these journeymen are to be replaced through apprenticeship, it follows that an equal number of apprentices must be completed each year to replace them. To supply these 450 new journeymen each year, through a five-year period of apprenticeship, 2250 apprentices must be in training at all times.

These figures are based on the assumption that all who start training complete their apprenticeship. We know, however, that in patternmaking, as in every other craft, all apprentices who enter the craft do not complete their training. We may assume this dropout loss to be approximately 25 per cent. If we add the 25 per cent dropout loss to the number of apprentices needed to keep the patternmaking industry at its present level of proficiency, we find that about 2800 patternmaker apprentices are needed at all times to assure the replacement of normal journeymen losses.

The foregoing figures take into account only registered apprentices. We know that a small percentage of shops that hire apprentices fail to register with a state or federal agency, either because of failure to subscribe to established standards or for other reasons.

In view of the fact that the patternmaking industry has in training a considerably less number of apprentices than it needs to replace normal journeymen losses, it is important that greater effort be expended within the industry to strengthen apprenticeship throughout the country. It is recommended that those shops that have facilities for training, hire at least one apprentice and maintain as many additional apprentices in training as is consistent with established ratios.

In view of the fact that nearly one out of every four apprentices who enter the patternmaking craft fails to complete his training, much could be done by local Joint Apprenticeship Committees to cut down the number of dropouts. Careful study of the reasons for these dropouts should be made and immediate steps taken to alleviate this wastage. Intensive screening of applicants by local Joint Apprenticeship Committees will help immeasurably in preventing those incapable of acquiring the skills needed in the craft from entering the ranks of apprenticeship.

Many local Joint Committees are utilizing various aptitude tests in selecting applicants for apprentice training. Through these tests, the committees are seeking to obtain only the highest qualified applicants for training. At the present time, local public employment offices in more than 20 states are providing aptitude tests under such programs.

It also is recommended that all patternmaking shops having facilities for the training of apprentices utilize these facilities to the utmost. In a survey of 2403 patternmaking shops conducted by the Bureau of Apprenticeship three years ago, it was found that of 1725 shops adequately equipped for training, only 753 were training apprentices under registered programs. This survey points up the fact that if every patternmaking shop having training facilities would use them to the best advantage, necessary craft replacements would be available. This observation applies not only to the patternmaking craft, but to all crafts. If the more than 400,000 establishments throughout the country that are equipped to train apprentices would do so, it would be a relatively easy matter to make all journeymen replacements with skilled workers.

Editors' Note: This article is condensed from an address given by the author recently before the Patternmakers' Association of Philadelphia and Vicinity on the occasion of the 66th anniversary of the Patternmakers' League of North America.

(*Continued from page* 208)

claim is made that it is quite as satisfactory as the foreign sand.

With cope and drag bolted together, the assembly is rolled over, the false cope is removed, and the sand is shaken out. Small cores and drawbacks are rammed individually over the exposed part of the pattern. The same procedure is observed while the drag is rammed. Arbors for reinforcing cores and drawbacks are made from pieces of ½ to ¾-in. square-section bars. They are bent to the required shape, and the various parts are wired firmly together at the points of intersection. Short pieces of steel pipe are incorporated in the arbors where the core is to be lifted or turned over while in the green state. With the necessary small sand blocks in place, the cope is set on and rammed full of sand.

The method adopted for making the main core in one of these castings differs materially from that employed in ordinary foundry practice, where a sweep or a corebox is supplied. In the instance under consideration, the mold serves as a corebox. The cope is lifted off and the pattern is removed from the drag.

(*Continued on page* 212)

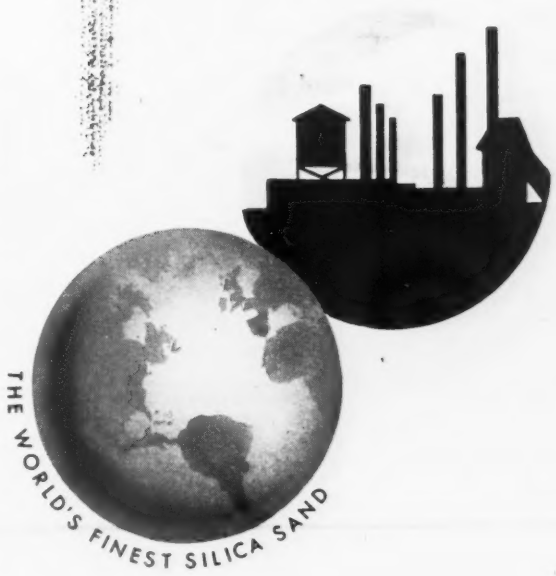
one of Industry's most important ingredients . . .

SILICA SANDS

Supplying one of America's most vital needs, the foundry man is ever striving to incorporate finer quality and more efficient methods into his products. To this common end, Ottawa Silica Company, through constant testing and research, has provided the industry with the finest of QUARTZITE products.

Whatever your need—blasting, core, or molding sand, Ottawa's quality and purity offers better control, better molds, and less casting loss.

Remember too, Ottawa's strategically located plants and excellent transport facilities assure you prompt delivery of all grades.



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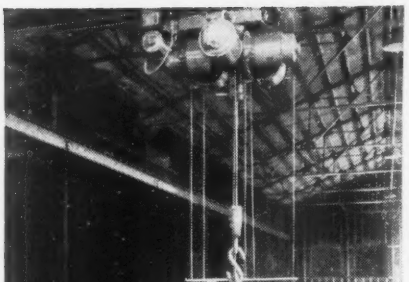
SHEPARD NILES
Floor-Operated Hoist

Operator mainly occupied with other duties. Hoist used for fast, efficient handling of relatively short hauls.



WHICH HOIST is RIGHT FOR YOUR JOB?

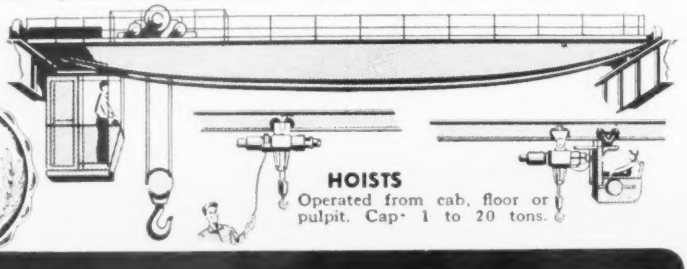
SHEPARD NILES
Cab-Operated Hoist

Operator in cab moves loads along at high speeds—occupies best vantage point for spotting or stacking materials.

Choosing the hoist that's right for your job calls for expert advice.

Let the Shepard Niles representative in your area guide you in your choice. He specializes in through-the-air handling—can help you select the hoist that best fits your job. Write Shepard Niles today for latest bulletins describing both types of hoists—and ask to have a representative stop by your office.

CRANES
Overhead: Top running, inner running, under running, floor or cab operated. Cap: 1 to 450 tons.



50th ANNIVERSARY
SHEPARD NILES CRANE & HOIST CORP.
1903-1953

HOISTS
Operated from cab, floor or pulpit. Cap: 1 to 20 tons.

SHEPARD NILES
CRANE AND HOIST CORPORATION

1324 Schuyler Ave., Montour Falls, N. Y.

(*Continued from page* 210)

The cope is then replaced, and the mold cavity is rammed full of sand. The mold is taken apart, and a thickness of sand corresponding to the desired thickness of metal in the casting is shaved from the core. Briefly, the foregoing describes the process, but from the intricate character of the work it is apparent that progress is slow and that the highest degree of skill and accuracy is required on the part of the operator.

An armature conforming approximately to the general contour of the mold cavity is fitted in the drag part of the mold. Projecting members of the armature rest on the mold joint and serve to anchor the core in place when the sand thickness has been removed. With the mold cavity rammed full of sand, the entire mold is rolled over, and the drag is lifted off to expose one-half of the core. Short nails with broad heads are inserted within a few inches of each other all over the surface. The heads are flush with the sand surface and furnish a reliable guide for the removal of the required thickness of sand. In this method the core is not removed from the mold. It is left in place. The thickness of sand is removed first from the drag side. Then the mold is closed and rolled over the second time. The cope is lifted off, and the sand thickness is removed from the cope side of the core. In another method sometimes practiced, the core is lifted out of the mold, shaved and then returned to place. This obviates rolling the mold twice to obtain the proper position.

Core Is Dried in Oven

Having served their purpose, the nails are removed and the surface of the core is painted with a thin solution of blacking in molasses water. Under certain conditions, to prevent sagging during the drying period, special sand blocks are used. The dried mold is taken from the oven and the core is lifted out, cleaned and reasssembled. The small cores and drawbacks are attached to the face of the mold with small hooks and wires.

The distance that molten metal will flow depends on fluidity and volume. A large thick stream will remain in the liquid state and flow farther than a small thin stream exposed to the temperature-robbing effect of the mold walls. Walls of a statue or other piece of ornamental bronze are relatively thin. Therefore, metal from a thin gate, irrespective of its fluidity, will not travel far from the source. To meet these conditions, metal is introduced through a multiplicity of gates, each

one designed to fill a definite area of the mold. Also, and this is one of the most important features, the metal in each area must be in a fluid condition when it meets metal from adjoining areas, so that the metal in the various areas will unite to form an unbroken entity.

No definite rule can be laid down on this subject since these castings are largely of an individual character and in the great majority of instances are not duplicated. Almost without exception, the detail of gates for any given casting is peculiar to itself. However, the general principle is the same in all cases. A large reservoir or basin is erected on top of the mold. A large sprue from the bottom of the basin conducts the metal to the required number of gates leading to various parts of the mold cavity. The main sprue and its numerous ramifications may be compared to a tree stump and its numerous roots. The tip of each root is a gate opening. In large castings the roots may vary from a few inches to several feet in length and from a fraction of an inch to over an inch in diameter. Wooden dowels are used to form the gates.

All gates are directed to the large sprue connected to the pouring basin and capable of holding the required amount of metal. This basin is dried and then placed on the cope with an opening or openings in the bottom coinciding with the sprue or sprues in the cope. A clay plug built around one end of a steel rod is placed in the opening over the sprue. The rod extends above the top of the basin and usually terminates in a loop or ring, by which it is lifted after the basin is filled with molten metal. Where the basin is not large enough to hold all the metal, additional metal is added from a ladle as the metal sinks in the basin. A small riser on the highest point of the mold indicates when the mold is full. Surplus metal is drained from the basin through a taphole at one side, near the bottom. This excess metal may be poured into ingots or poured back into the furnace for another job.

Various mixtures are melted for statuary castings. One of the most widely used is the familiar eighty five, three fives—85 per cent copper and 5 per cent each tin, lead and zinc.

Opens New Building

Aerovent Fan Co., Piqua, O., has opened a new general office building at 700 East Ash St., Piqua. Built on the company's original office site, it features a five-zone air-conditioning system and many other modern innovations.

to eliminate sand conditioning problems like these . . .

A New York Foundry says of its Sandcutter: "We find the sand is far more properly mixed and the moisture is distributed evenly throughout the heaps. We find we are able to use finer sand due to thorough mixing and, of course, get a better finish."

poor sand conditioning

From an Ohio Foundry: "With our Sandcutter we found that we were able to reduce our costs greatly, obtain a more uniform sand which in turn aided us in increasing our production, reducing our foundry losses and producing a casting of better finish."

high cost

A Wisconsin Grey Iron Foundry reports: "We have found that we have cut our molding scrap losses better than 35% with our Sandcutter as compared with the hand method of cutting sand."

molding defects

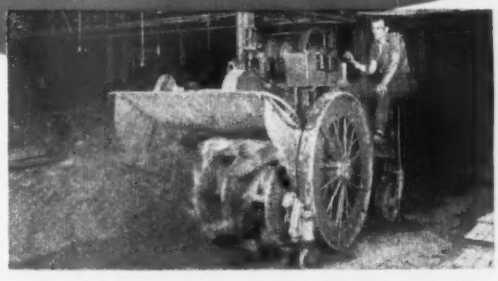
From Chattanooga, Tennessee: "Before our Sandcutter was installed we were operating twenty-two floors, requiring the services of three shakeouts. At the present we are operating thirty-one floors with no increase in labor."

low productivity

In Jersey City: "Absenteeism was formerly a serious condition with the night crew, but now that the Sandcutter has disposed of the 'back breaking labor' of continuous shoveling, we have also disposed of our absentee problem."

absenteeism

switch to **SANDCUTTER®**



There is a size Sandcutter available for every sand conditioning requirement. Write for complete information today.

SANDCUTTER®

American

WHEELABRATOR & EQUIPMENT CORP.

505 S. Byrkit St., Mishawaka, Indiana

Tools for Quality Control

(*Continued from page* 113)

be used, and the chill sample should be fractured in the same position. Observation of the depth of chill and the gray fracture should be correlated with some chemistry, preferably total carbon and silicon, with the physical properties of the metal in a test bar, and with the physical properties of the metal in the castings.

3. A chill test should be made on every ladle poured. In our foundry operations, the chemical composition of the metal, as tapped, is designed for control purposes to take a late inoculation of ferrosilicon, which also has the function of a corrective. Other common alloying elements and inoculants are used as late additions to control metal specifications.

The chill test is conducted by an "alloy man" (our designation) who has been specially trained in the use of inoculants and alloys by being taught some physical metallurgy and the effect of these late additions on the physical properties of the metal. These alloy men are trained for the job by working with the metallurgical department and the melting foreman. The alloy man is supplied with the tensile strength, brinell hardness, transverse strength and deflection, the fractured appearance of the tensile strength specimen and a chemical analysis of the specimen so that he can compare his chill-test fracture with the tensile strength and the other properties mentioned when they are obtained from the laboratory. This procedure is carried out each time a standard arbitration test bar is poured.

We have numerous castings which are required to be within a certain range of hardness at points agreed upon by the customer and the foundry. It is customary for us to move the brinell hardness machine to the work station of the alloy man when these castings are in production. In this manner we have a direct correlation between chill test and hardness in the casting each time a ladle is tapped from the cupola.

Chemical Analysis—The analysis of casting defects will indicate the need for metal control and, if a start toward controlling metal chemistry is made, its effect will be far reaching. Normal gray iron, containing carbon, silicon, manganese, sulphur and phosphorus, is a complex material, and it is now being complicated further by the presence of residual amounts of the commonly used alloys of nickel, copper, molybdenum, chromium and vanadium and by undesirable elements such as aluminum, tin and lead.

Some of the procedures which we have incorporated with our melting operation for control purposes are as follows:

1. All metallurgical coke is forked from the railroad car to prevent breakage. Clam-shelling coke is not permitted under any circumstances.

2. Silvery pig iron, ferro-manganese and other concentrates are weighed upon small, appropriate scales rather than on the regular charging scales.

3. Automotive cylinder blocks, our only source of purchased cast scrap, are stripped of all aluminum, bearing metals, copper gaskets, crankshafts, cast iron high in phosphorus content and rubber.

4. Foundry return scrap, alloyed and regular melt, is separated at the foundry shakeouts and stored on separate piles in the yard.

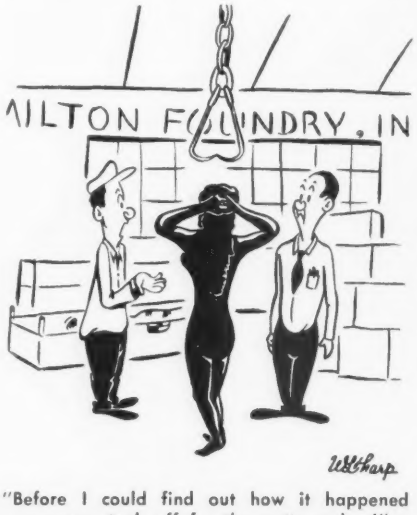
5. The cupola blast is weighed by an air-weight control on the blower.

6. Carbon electrodes and graphite anodes are used in the coke charge to increase total carbon content in the iron. With these materials, it is possible to compensate for metallurgical coke which may be below standard in strength and carbon-raising ability.

7. Coke, which we receive from three suppliers, has been evaluated metallurgically and from the point of view of economics. Coke from the three sources is interchangeable in our melting operations at Lynchburg.

8. Metal tapped from the cupola is desulphurized to a selected range by an addition of fused soda ash. We have found recently that sulphur is one element in cast iron which affects physical properties rather drastically and should be controlled within a suitable band of narrow tolerance.

9. In this discussion only a few of the major procedures for metal analysis control are listed. For more complete information concerning our control of cupola melting and metal chemistry, it is suggested that one review the various papers prepared and published by W. W. Levi. His work is a continuation of a study started by the late Max Kuniansky about thirty years ago. It should be pointed out that the quality control program for control of cupola melting and chemical composition of gray iron melted in the cupola has been in progress for this period of time at the Lynchburg Foundry Co. Mr. Levi has concentrated his efforts from 1934 until the present time on refining and improving cupola melting. Recent developments in the metallurgy of cast iron have indicated that there is still much to be learned about cupola melting.



"Before I could find out how it happened everyone took off for the pattern shop!"

Sand Control—An active program of sand control undoubtedly is vitally necessary in the modern foundry. Scrap losses from sand causes, cleaning costs and fast molding equipment require the sand properties to be held within reasonably close tolerances.

Sand control, as such, does not mean simply making sand tests on the equipment now available for such purposes. It must go beyond the record of the laboratory technician to someone who analyzes the tests and takes steps to control all the properties within the necessary tolerance band for each.

Work in the sand control field involves a very thorough study to establish the character of the basic materials from which the sand mixtures are made. Then a study must be made of the contemplated blend of these materials in the form of a mixture to go to the molding machines. Each piece of equipment—muller, elevator, aerator, molding hoppers and shakeout belt—has an effect upon the properties of sand, and it is necessary to have this information before practical sand mixtures can be developed and controlled.

At the Lynchburg plant, we have the main sand laboratory for both company plants. It is equipped with testing devices to study sand at room temperature in the green state, to study sand in the dry state at medium elevated temperatures and to study sand properties at high temperatures. In our two plants, Lynchburg and Radford, we have three shop laboratories located at the sand mixing stations where we test sand in the green state for moisture, permeability, green compression, and deformation. For best control, it was found necessary to establish these sand testing laboratories at the mixing stations rather than to have the main laboratory attempt to do this work.

We had an interesting experience selling sand control to the foundry operating group which may prove valuable in your work expanding quality control. When the laboratories were

(*Continued on page* 216)

telling the story of 'dag' dispersions

Here is a Better Parting Compound ...No Smoke at Any Temperature

It's a 'dag' dispersion . . . a material that's first of all a friction-fighting, heat-beating mold wash. Spray it on, paint it on, apply it by dipping. Molds, patterns, chills, cores . . . even push pins, shoulder screws, flask pins, and ladle interiors . . . they'll all take on a microscopically thin, slippery, *dry film,* that will banish sticking for good.

Try 'dag' dispersions. Parting will be quicker, castings will be smoother, than with any other parting agent. Binding and stripping will be eliminated. Chills will tap off easily without damage to casting surfaces.

As an added benefit, water dispersions of 'dag' colloidal graphite get rid of the irritating smoke caused by most parting compounds.

You can learn more about 'dag' parting compounds by asking for Bulletin No. 425-14K.

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

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Acheson Colloids Company, Port Huron, Mich.

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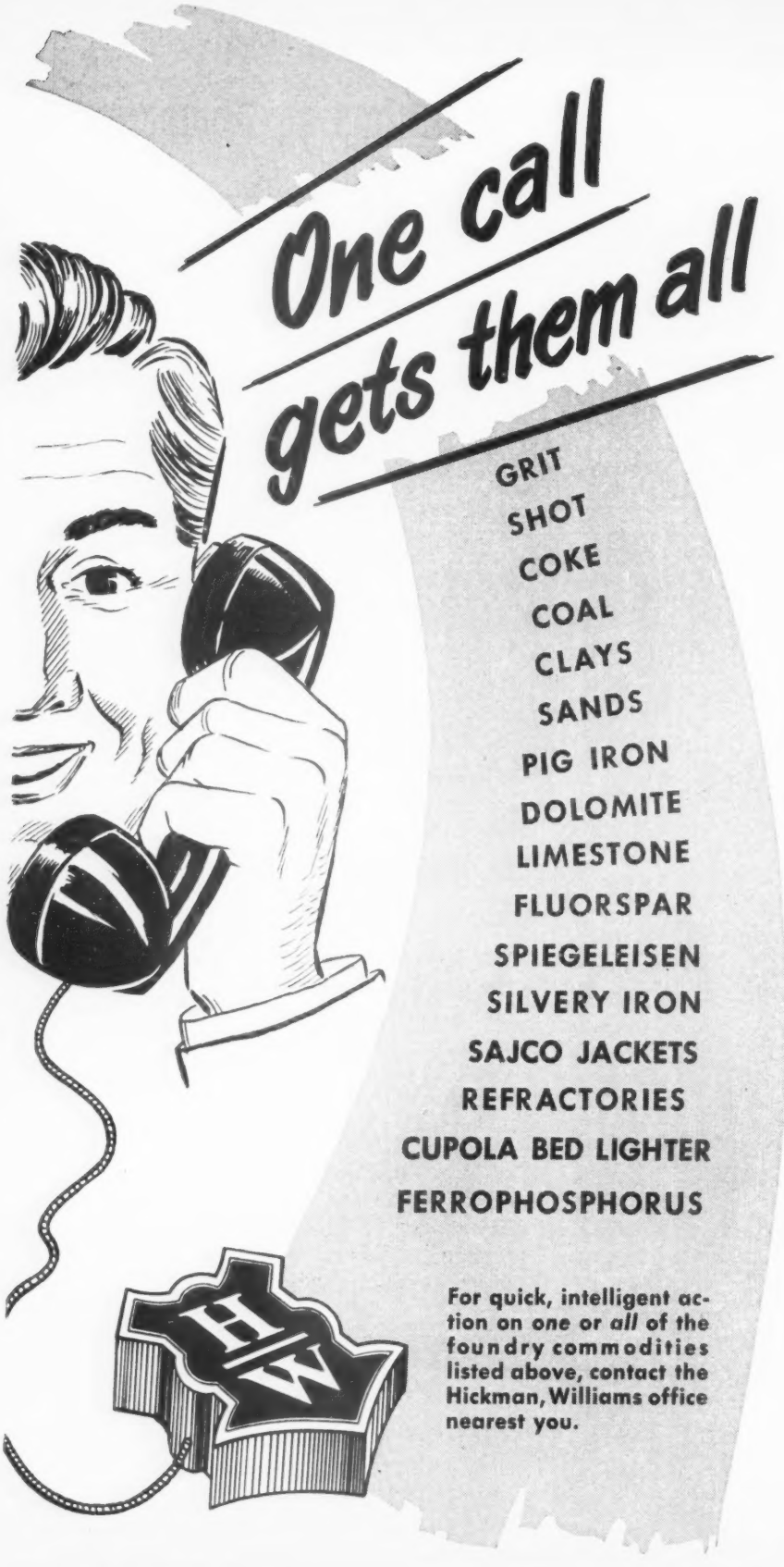
Units of Acheson Industries, Inc.

try resin-bonded dry graphite films for permanent lubrication



(*Continued from page* 214)

installed at the mixing stations, we felt that the laboratory technician could ably control the mixtures set forth by instructing the operators of the mullers from the results of his tests, but this procedure was not successful. We tried having the laboratory technician report the results of the sand tests to the muller operators and attempted to control the sand mixtures by having muller operators assume responsibility, but this attempt also was not successful. Our best results have been with a group of men who interchangeably work in the sand testing laboratory and operate the mullers. In this way, each of the group recognizes and appreciates his fellow workers' problems and works very successfully as a team.

It was our practice to have the laboratory technician record his test results on preprinted forms. This form had a separate chart showing the desired range of the properties for which the technician was testing. There has been an appreciable improvement in the control of the sand properties at the muller by having the men plot control curves, each having its own band of control.

Necessary Procedures

Some of the procedures which we have found necessary and which may be incorporated into shop practice without difficulty are listed as follows:

1. Weigh all dry components of core and molding sand mixtures. Carefully measure with standard liquid measures, not with a bashed-in tomato can, all liquids which are part of molding and core sand mixtures. It is preferable to meter these liquids.

2. Establish fixed mixing cycles for the equipment used to prepare core and molding sand mixtures. It is definitely advantageous to mull or mix the sand at lowest possible moisture content with the dry additives for a specified time before adding liquids such as core oil, synthetic resins, and water. The desired properties in the sand mix should be established by adjusting the bonds and mixing cycle. This can best be done by testing the sand at various intervals during the mixing cycle.

3. Strive for a control of grain segregation in the dry silica sands used in your core mixtures.

4. Determine the proper baking temperature and time for cores by using temperature pellets embedded in the center of the core in the green state.

5. To control rammability of the molding sand, it is strongly recom-

mended that the green compression-deformation or green compression-tensile tests be used rather than a test for green compression or green shear strength individually.

6. Test new sand on arrival at the foundry and work out testing procedure so that you have a representative test. Compare your findings with those of the producer and work this problem of testing out carefully. Representative tests by you and your supplier will form the basis for improvement by a more careful selection or preparation of the base sand.

7. Sand tests made at the mixing stations in the shop as rapidly as the technician can perform them will indicate sources of variables in the molding system which can be traced and then eliminated.

It should be pointed out in this discussion of sand control, as we have pointed out in the discussion of cupola melting, that our sand studies have been going on for a period of years. Mr. Kuniansky purchased the first set of sand testing equipment manufactured by Harry Dietert in 1924, and we feel we are still far from perfection.

Inspection—The work of our inspection department has been outstanding in our quality control program, particularly in reducing rejects in the field and actively entering into the effort to eliminate rejects in the foundry so that foundry scrap has been reduced.

Inspection personnel work with every department within our company and with the people supplied by the customer in his plant who are best qualified to cope with the particular problem involved. Their work begins with a deviation from expected quality, which directs their attention to patterns and coreboxes, flask equipment, design of jigs and fixtures for foundry and machine shop operations, dimensions of baked cores, chaplet design, metallurgy (if porosity or machinability is the problem), pattern shrinkage and to other equipment and production procedures for making the casting.

The success of the work of our inspection lies in the fact that it has not been satisfied just to rule that the product is or is not satisfactory, but studies the problem carefully enough to initiate action to have it corrected. In our foundry, we could well change the name inspector to foundry methods engineer in order to describe the scope of the work better.

The inspection department was

(*Continued on page* 220)

with ★STARRBIDE

CARBON-BONDED SLAG HOLE BLOCKS

Longer Cupola Runs because Starrbide Carbon-bonded slag hole blocks stay in use longer than ordinary blocks.

Reduced Erosion
from heat and slag flow to an amazing minimum.

Improved Flow Control
because runs are longer, more easily scheduled.

Higher Thermal Conductivity
rapidly dissipates heat.

Greater Production
because shutdowns are reduced.

AMERICAN REFRACTORIES & CRUCIBLE CORP. NORTH HAVEN CONNECTICUT

ALSO MAKERS OF FAMOUS STARRBIDE CARBON-BONDED CRUCIBLES, GRAPHITE CRUCIBLES AND SUPER REFRACTORIES.

NOW...

CLEAN, DUST FREE AIR INSIDE THE FOUNDRY!

WHITING SUPPRESSOR ELIMINATES SMOKE AND FUMES AT CHICAGO STEEL FOUNDRY CO.

Clean air . . . dust free, fume free! Improved production! Better working conditions! These are results achieved by Chicago Steel Foundry Company with a Whiting high temperature, fibre glass Bag-Type Suppressor for operation with a Whiting Hydro-Arc Electric Furnace.

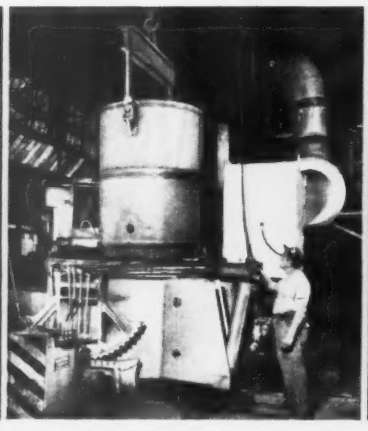
This Suppressor installation, first of this type to be used with an electric furnace in the midwest area, offers new proof of Whiting efficiency in reducing foundry dust control problems . . . whatever the melting process.

Smoke and fumes are drawn from the furnace through an enclosed duct to the bag house outside the foundry. Here the fibre glass bags utilize the "vacuum cleaner" principle to remove smoke, dust and fumes. Fibre glass construction of the bags enable them to withstand temperatures up to 500°F. without loss of efficiency. Water cooling is not needed. Shakeout of bags may be manual, as it is here, or mechanical.

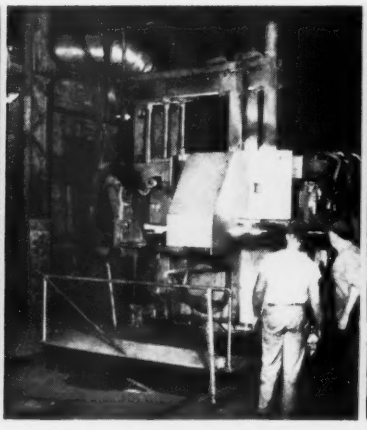
WRITE! Ask for full information on Whiting Bag-Type Smoke and Fume Suppressors for use with cupola or electric furnace.

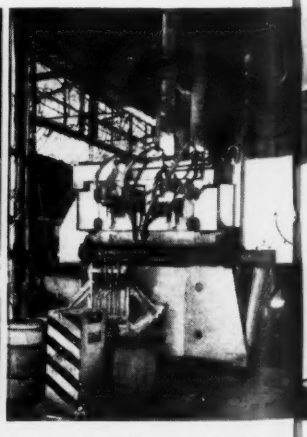
WHITING CORPORATION
15607 Lathrop Avenue, Harvey, Illinois

WHITING
FOUNDRY EQUIPMENT



Roof of the Whiting Hydro-Arc Electric Furnace used by Chicago Steel Foundry swings back to permit fast, even top charging, mechanically controlled from pendant push button station.

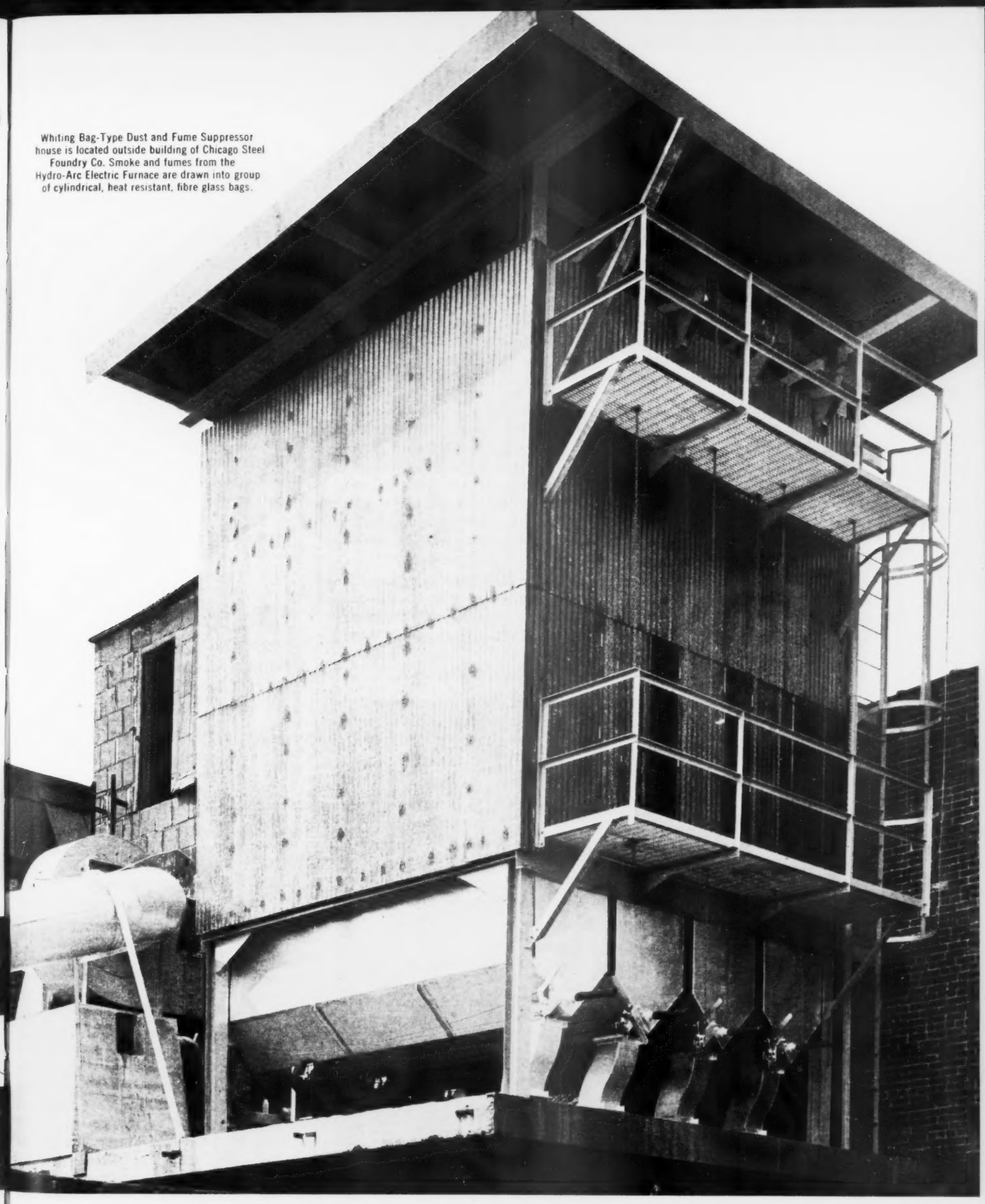




Two views of Hydro-Arc Electric Furnace show how Whiting Bag-Type Suppressor completely eliminates smoke and fumes during the melt to provide a clean working atmosphere. Photo at right shows duct through which smoke and fumes are drawn to bag house outside building.

Make your foundry more productive . . . a better place to work!

Whiting Bag-Type Dust and Fume Suppressor house is located outside building of Chicago Steel Foundry Co. Smoke and fumes from the Hydro-Arc Electric Furnace are drawn into group of cylindrical, heat resistant, fibre glass bags.



WHITING ENGINEERED FOUNDRY EQUIPMENT

Cupolas • Cupola Spark Suppressors • Cupola Hot Blast Equipment • Cupola Blast Moisture Control Equipment Cupola Charging Systems • Cupola Coke Igniters • Cradle Furnaces • Converters (Steel) • Duplex Melting Systems • Air Furnaces • Electric Melting Furnaces • Ladles • Ladle Handlers • Tumbling Mills • Annealing Ovens and Arcs • Pulverizers • Pulverized Coal Firing Systems • Turntables • Electric Traveling Cranes • Trackmobile • Trambeam Overhead Handling Systems • Electric Chain Hoists

(*Continued from page* 217)

created to prevent the shipment of obvious scrap castings which should have been rejected by the ordinary visual inspection. The work in this stage involved only visual inspection on the shipping dock, but during the past few years has expanded to its present place in our foundry organization. Both plants had individual inspection, somewhat isolated from each other, of this nature.

The foreman of the inspection group reported directly to the plant manager, not to the foundry superintendent, and under his direction developed inspection as we have it today. When the Lynchburg plant inspector was made chief inspector and became responsible for inspection at both plants, his immediate supervisor was changed to the assistant general manager. Recently, the supervision of inspection has been assigned to the director of manufacturing research and methods, indicating that the work of the inspection department is more that of the methods engineer than general inspection.

For the purpose of developing better quality control, however, it is significant that the inspection department has extended its work and expanded its activities under the direction of the plant manager. The latter changes in supervision of inspection have not been in effect sufficient time to judge whether there is a distinct advantage in the most recent change in organization.

Briefly, the duties of the inspection department and the general scope of their work is as follows:

1. A roving inspector, on duty each hour that castings are being made, proceeds from shakeout to shakeout and to the various cleaning stations to check for defective castings. He is specifically interested in the appearance of those defects which, by experience, we know may appear on a certain casting. The defects which he searches for are those for which we have not installed corrective measures or where we have not had the opportunity to correct some discrepancy in the pattern.

2. The chief inspector has a regularly scheduled visit to all of our customers' plants. A careful study of all rejected castings, which are held from visit to visit for his check and of all other product defects is made.

3. All engineering changes requested by the customer are handled by the inspection department. Pattern changes are made, and sample castings are produced, marked and forwarded to the customer. Upon final approval by the customer, inspection releases the change to the production office.

4. Inspection periodically, usually once an hour, depending on the size of the casting, selects a casting at the shakeout, expedites it through cleaning and takes it to the layout plate for dimensional checks. One of the very important assignments of the inspection department begins at the layout plate. Depending upon what is found in the way of defects or dimensional discrepancies, the inspector on the plate proceeds immediately to the foundry foreman responsible for the condition and works with him to eliminate it. This work involves gages for flasks and close-up pins, core-rubbing fixture adjustment, core-assembly adjustment, and the core-setting operation, particularly if we are using a shim of any nature.

5. Certain castings from each day's production are specified for destructive testing for internal porosity, for physical properties and for measurement to check wear on patterns and core box equipment. This work is carried out in conjunction with the metallurgical laboratory.

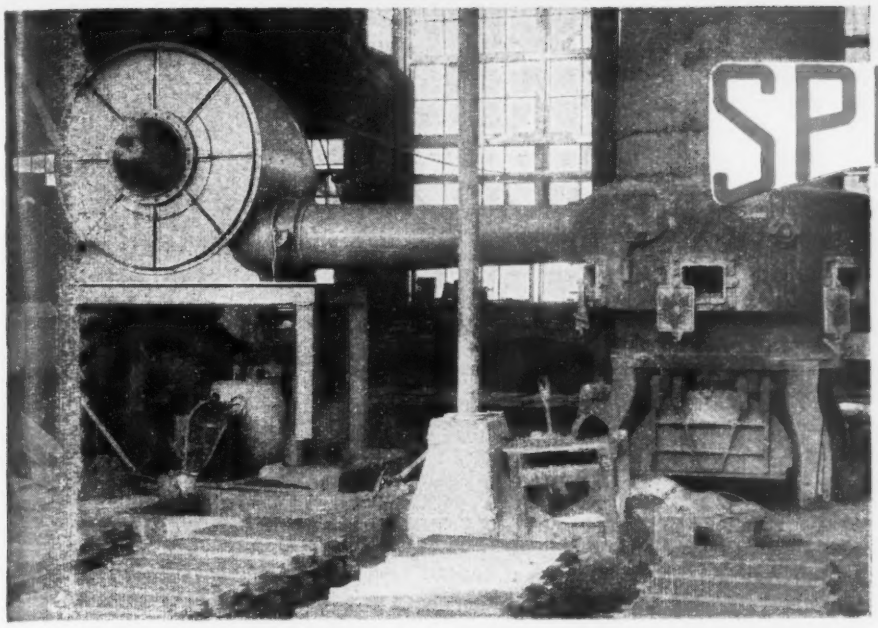
6. Inspection has taken charge, for good reason, of the metallurgical inspection of certain chilled iron castings and the brinelling of all production castings where a 100 per cent brinell check is necessary.

Conclusion — When we speak of control in the foundry, we mean elimination of some of the variables which enter into the making of the casting, as well as recognition and development of means of compensating for other variables that cannot be eliminated immediately or entirely. Quality control, therefore, means the continued effort to cope with and compensate for variations in regular foundry production procedure in order to assure a satisfactory casting for our customer each time his casting is reproduced. We must keep in mind that the customer will continue to demand further product improvement, and our efforts must be so directed as to anticipate and be prepared for such demands.

The perfect casting has never been produced. We should shoot at this

(*Concluded on page* 222)

PLASTIC CORE DRIERS for use in dielectric core ovens are molded of thermosetting Plaskon alkyd molding compound reinforced with glass fiber in a 200-ton semiautomatic compression molding press developed by Stokes Machine Co., Philadelphia. Machine is designed for relatively deep-draw parts and turns out about 12 large, precision core driers an hour. Formed Plastics Co., Toledo, O., developed the drier for use in dielectric ovens which require nonmetallic materials to prevent arcing



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SPENCER TURBO-COMPRESSORS

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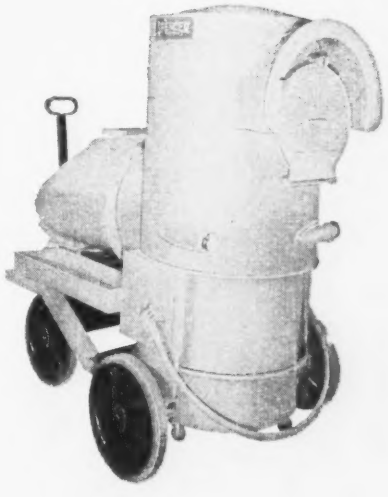
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

A good, dependable air supply is the heart of any foundry operation. Once the amount of air for a given charge is determined, the Spencer Turbo will continue to provide the desired amount, day in and day out for years without interruption.

This dependability is built-in. With wide clearances, only two bearings to grease and an all-metal bridge-like construction, there is little that can go wrong even in the most severe and prolonged service.

Spencer Turbos are particularly noted also for their compact, light weight construction and comparatively quiet operation. They can be mounted anywhere—overhead, or on the floor without special foundations.

The control may be manual, by means of a calibrated ammeter and blast gate, or complete automatic air-weight control with recording charts may be used. Ask for the Spencer Foundry Bulletin No. 112.



7½ HP *Heavy Duty*

And for Foundry Housekeeping——

Spencer Industrial Portable Vacuum Cleaners are solving the housekeeping problem in all types of foundries, large and small. Periodic overhead cleaning, picking up molding sand and cleaning molds, patterns and finished castings are a few of the jobs that make Spencer Vacuum pay for itself in a few months. Bulletins on request.

SEE SPENCER AT THE METAL SHOW, AGA BOOTH NO. 2643

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER
HARTFORD

414 B

(*Concluded from page* 220)

perfection target with a quality control gun.

Projects Under Development — It should not be forgotten that quality control is as important in the development of new products and methods as in maintaining quality in existing castings. In turn, these same new development also have permitted us to understand standard production methods better and to have more accurate control of them.

Some of the projects which, when completed experimentally, will be very useful in further improvement in our quality control program are as follows:

(1) A study of the effect on melting control by adjusting the chemical composition of the slag in an acid cupola. Laboratory equipment for the chemical analysis of these slags has been found necessary to correlate our slag chemistry with the metal chemistry.

(2) Two new compounds which are to be used in conjunction with the synthetic resin binders in the core mixtures are now under study. The use of these materials will improve our dimensional control of baked cores.

(3) The work of the pilot foundry is being extended into all phases of making and cleaning a casting. New personnel and equipment are being introduced to the pilot foundry operations so that we can make more fundamental studies of gating and risering, sand properties and the mechanical equipment necessary for making molds.

(4) A pilot operation for shell molding has been in operation for almost a year. It is expected that the procedure for handling shell molded castings will improve the handling and cleaning operations of our regular castings.

(5) We have been working for the past two years in the laboratory and on a semiproduction basis in one of our melting operations with the use of injected calcium carbide. The results of this work indicate some important developments in the metallurgy of cast iron and unquestionably will have effect on better control of the melting operations.

(6) The basic cupola has been a production tool in our shops since February, 1951. Our experience with this melting operation has led to improved efficiency in the use of fluxes and refractories in all of our melting operations.

(7) A concentrated program of the application of industrial engineering and work simplification has been successful in removing some of the variables encountered in the foundry operations.

(8) Our sand reclamation unit has been in operation since July, 1951. This equipment, together with our sand storage silos, has resulted in a better control of grain classification in the core mixtures and, subsequently, in better baked core dimensions. We are considering minor changes in both of these units which will refine our control of the distribution of grain size in our cores further.

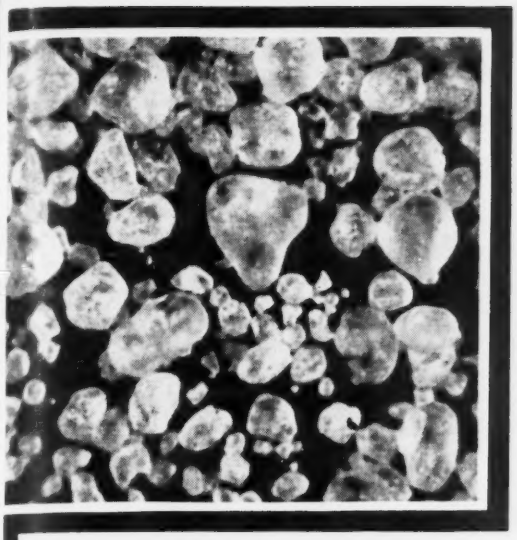
(9) Automatic timers have recently been introduced in the molding operations for control of shakeout temperature and its effect upon metal structure in the casting. Similar equipment will give us better control of the baking operation for our large cores.

(10) Use of spectrographic analysis of our metal is being extended to control the subversive elements in cast iron.

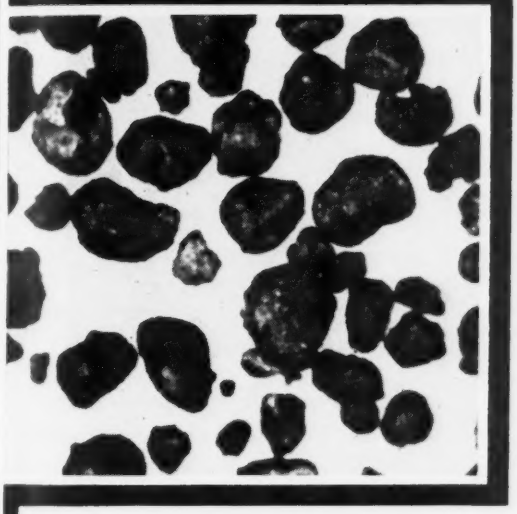
(11) We have already completed a laboratory study of the use of a polyelectrolyte (Lustrex X-886) soil conditioner in molding sands and have had a ten-day operating test in full production in the foundry. Results indicate that the use of this material may give us better control of our molding sand mixtures by reducing the number of materials used in the mixture, permitting greater latitude in their amounts and improving our control of rammability.

(12) New materials and procedures for making ductile iron are under study. The use of ductile iron as a new engineering material will increase, and we are studying the melting controls necessary for its production. Each new development has required improvement in melting control and has invariably permitted some parallel improvement in our regular melting control.

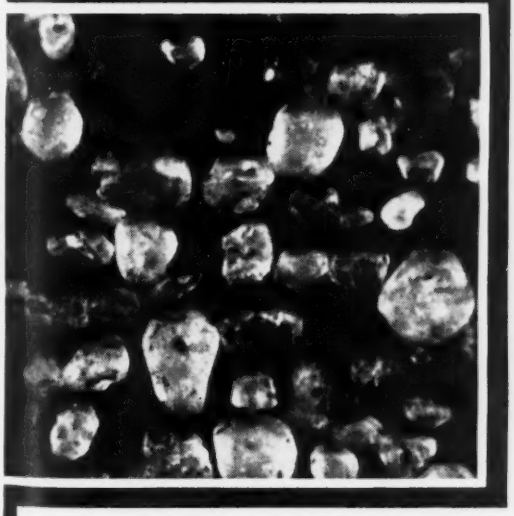
1 MILLION VOLTS: General Electric Co. recently installed the 1 million-volt x-ray machine shown here at the Battle Creek, Mich., plant of Eaton Mfg. Co. Housed in a 17 x 23-ft vault with thick concrete walls, it will be able to radiograph several hundred hollow-stemmed, sodium-cooled aircraft valves in one exposure. Its beam emanates throughout a 360-degree circle around the target of the x-ray tube. Left to right are Gerrit Hoogenboom, Eaton inspection foreman, and James Rhinehart and George Williams, GE representatives supervising installation of the unit



1. New sand—This is an Ottawa sand



2. Discarded sand



3. Sand reclaimed by Hydro-Blast method. Minute carbonaceous deposits represent coverage of a small percentage of grain surface; therefore do not detract from the physical characteristics of the sand.

Sand Reclaimed BY HYDRO-BLAST

is Better than new sand!

- **Laboratory photomicrographs prove what astute foundrymen already know from first-hand experience**
- **better surface finish on castings**
- **sharply lower costs of cleaning**
- **big cuts in costs of sand and sand transport —these potent benefits are reported by the many foundries employing the Hydro-Blast method of sand reclamation. No exceptions!**

It's no wonder Hydro-Blast is used in most of the leading iron and steel foundries in the U.S. and Canada.

To estimate how much you can save annually by using Hydro-Blast for sand reclamation, use a simple, self-survey form we've prepared for the purpose. You'll get a startling message, dictated by your own sand consumption and cost figures. Write us for Self-Survey Form S-200.

HYDRO-BLAST Corporation

2550 NORTH WESTERN AVENUE
CHICAGO 47, ILLINOIS

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

OBITUARY

WERNER FINSTER, 51, metallurgist, Textile Machine Works, Foundry Division, Reading, Pa., died Aug. 13. A native of Germany, Mr. Finster was graduated from the Bergakademie, Freiberg, with a degree in metallurgical engineering. He was research chemist, Carus Chemical Co., La Salle, Ill., in 1927-28 and for the following two years was associated with Deere & Co., Waterloo, Iowa, engaged in research and foundry metallurgy. In 1930 he joined Reading-Pratt & Cady Division, American Chain & Cable Co., Reading, Pa., as chief metallurgist. He had been with Textile Machine Works since 1948. Mr. Finster served on technical committees of American Foundrymen's Society, and was president of Reading Foundrymen's Association in 1948-49.

* * *

PROF. Kenneth H. Donaldson, 64, head, department of metallurgical engineering, Case Institute of Technology, Cleveland, died Sept. 3. Prof. Donaldson was graduated from School of Mines, Columbia University and went to Cleveland in 1921 as a consulting mining engineer and professor of mineral industry at Case. He has played an important role as head of the university advisory committee there in connection with scholarships sponsored by the Foundry Educational Foundation since the foundation was established in 1947.

* * *

Dr. E. Hugo, secretary, German Foundrymen's Association, and editor of *Giesserei,* German technical magazine, died Aug. 8. Dr. Hugo was a member of the German team which visited over 80 foundries in the United States last year. Drawing on his impressions of American foundry technical standards he outlined developments in German foundry techniques in his article on Germany which appeared in September FOUNDRY.

DR. E. HUGO

* * *

George Brooke, 86, until his retirement several years ago, vice president of the former E. & G. Brooke Iron Co., Birdsboro, Pa., died Aug. 10. The company, now a division of Colorado Fuel & Iron Co., was founded in 1788 and was later incorporated by Mr. Brooke's father and uncle. Mr. Brooke was also vice president, Birdsboro Steel Foundry & Machine Co., until last year.

* * *

Albert C. Brown, 89, for 43 years president, Chicago Faucet Co., Chicago, died Aug. 29. Mr. Brown, an inventor and designer of plumbing supplies, retired in March. He was a past president of the Plumbing and Heating Industries Bureau.

* * *

L. M. Klinedinst, former vice president and director, Timken Roller Bearing Co., Canton, O., died there

THREE-WAY PROTECTION!
with one compact shut-off valve
ECLIPSE
LOCK-TITE
SAFETY VALVE
Approved by
Factory Mutual
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Companies
FM
Provides instant, positive shut-off in event of air, gas or electrical failures
Here's the ultimate in gas safety shut-off control! For all types of gas combustion systems, the Eclipse Lock-Tite Safety Valve protects against air, gas or electrical failures—or a combination of any two!
Spring-loaded main valve seat and power unit pistons assure positive, instantaneous closure. Tripping mechanism prevents manual opening unless control units are in operation. Can't be blocked open.
Combination of interchangeable controls provides multiple-shut-off protection
Five power units are interchangeable to give you absolute safety from electrical failure . . . air and gas pressure failure . . . gas pressure and electrical failure . . . or gas failure alone. Flange mounting and compact aluminum alloy construction provide easy installation in the line. For low, medium or high pressure gas. Available in six sizes, from 1" to 4" pipe size.
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State

Aug. 10. Mr. Klinedinst joined the company in 1905 and was vice president in charge of sales when he retired in 1948.

* * *

Lowell H. Stapf, 54, president, Globe Foundry & Machine Co., Amarillo, Tex., died July 29. In 1926 Mr. Stapf founded Star Machine & Foundry Co., Amarillo, which became Globe Foundry last year.

* * *

John S. Lyne, 30, vice president-general manager, C. H. Lyne Foundry & Machine Co., Miami, Fla., died Aug. 11. Mr. Lyne's father, the late Charles H. Lyne, founded the company.

* * *

A. Albert Klein, 64, for 10 years assistant director of research and development, Norton Co., Worcester, Mass., died Aug. 25, following 37 years with the company.

* * *

James M. Morrow, 58, vice president in charge of sales, Dayton Steel Foundry Co., Dayton, O., died Aug. 11 in Chicago. Mr. Morrow had been with the company 25 years.

* * *

John A. Schultz, purchasing agent, Ferguson & Lange Foundries Inc., Chicago, died there Aug. 26, after 40 years with the company.

* * *

Seth E. Campbell, 57, for 15 years sales engineer, J. S. McCormick Co., Pittsburgh, died Aug. 21, while visiting in Suffolk, Va.

* * *

Ellis B. Ridgway, 83, former vice president of Ridgway & Son Co., Coatesville, Pa., which discontinued business 15 years ago, died Aug. 13.

* * *

A. M. Giefer, vice president, Standard Conveyor Co., North St. Paul, Minn., died Aug. 22.

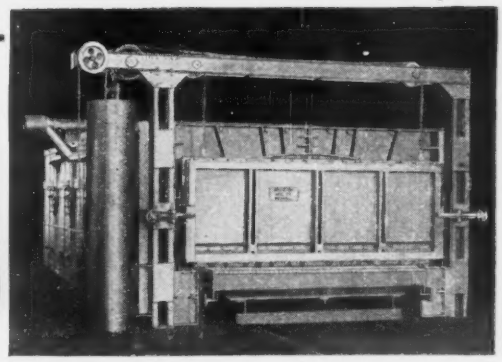
* * *

J. C. Miller, manager, Ideal Foundry Division, Republic Steel Corp., Newton Falls, O., died Sept. 2.

Booklet Tells How To Make Slide Films Cheaply

A new how-to-do-it booklet for business firms tells how tape recordings and color slides can be combined to tell a story or convey an idea in an interesting and effective manner at low cost. The 20-page, illustrated booklet is entitled "How to Make Your Own Slide Film Presentation for Less Than $20" and is available upon request from Minnesota Mining & Mfg. Co., St. Paul.

FOR NORMALIZING ANNEALING AND ALL HEAT TREATMENT OF CASTINGS



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You'll get clean heating, high efficiency, and fuel economy in the Johnston furnaces. Engineering experience is also apparent in their smooth mechanical operation—in their roller bearings in car and door hoist shafts, and power operated car pullers. Write today for bulletin F-240.

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• MELTING FURNACES • HEATING TORCHES • LADLE HEATERS
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CHILL KOOLHEAD NAILS
Chill Nails and Spiders
for... ACCURATELY CONTROLLED FOUNDRY CHILLING
Write for samples and prices
Choose any style from Jumbo to Stubby; slim, medium or horse nail blade; blunt, pointed, straight or 90° bent. There's a type and size Koolhead Chill Nail or Spider Chill to do your specific chill job best.

You can rely on "KOOLHEAD" and "STANHO" products

STEEL Stanho PRODUCTS
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IRON FOUNDRY ALLOYS

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- *Produced to the highest standards of uniformity from the finest of raw materials.*

FERROCHROMIUM ALLOYS

Iron Foundry Grade—a readily soluble alloy for moderate chromium additions to cast iron.

High Carbon Grade—a standard alloy for ladle additions to irons melted at high temperatures, and for cupola addition as lump material.

Briquettes—a practical and convenient form for adding ferrochromium to the cupola.

Ferrochrome-Silicon—a medium carbon grade of this alloy is recommended as an ideal means of reducing chill, increasing strength and maintaining uniform structure in cast iron.

FERROSILICON ALLOYS

25% Grade—recommended for cupola or electric furnace additions.

50% Grade—a most economical means of adding silicon to the cupola charge.

75%, 80/85%, 85/90%, 95% Grades—for graphitization, inoculation and structure control of gray cast iron.

Briquettes—a practical and convenient form for adding ferrosilicon to the cupola.

FERROVANADIUM ALLOYS

Iron Foundry Grade—an economical means of improving the physical properties of cast iron.

SPECIAL ALLOYS

Graphidox No. 4—an alloy of silicon, titanium and calcium which gives maximum efficiency as an inoculant of cast iron.

V-5 Foundry Alloy—an alloy of chromium, manganese and silicon highly effective for controlling structures, increasing strength and reducing chill in cast iron.

Noduloy Alloys—widely used in the production of nodular cast iron.

There is also a complete range of Vancoram alloys for steel foundry applications.

Your nearest Vanadium Corporation office will be glad to give you complete information on any of the Vancoram Foundry Alloys.

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Pittsburgh · Cleveland · Cincinnati · Columbus · Toledo

Activities of Foundry Groups

Chicago

THREE hours of heavy rain starting in late morning threatened the usual success of the annual stag outing and golf of the Chicago Chapter AFS on Saturday, Aug. 8, but skies cleared in time to permit the planned program to proceed. Held as in the past at Lincolnshire Country Club in Crete Township, Ill., the event attracted nearly 1100 members and guests. This matched attendance at the 1952 outing which was held under ideal weather conditions.

Although the rain restricted the number playing golf, this was still the majority pastime. Some preferring less strenuous exercise participated in an early afternoon horseshoe tournament. The more sedate just sat and allowed themselves to be entertained by a strolling musical group.

The annual weight guessing contest conducted throughout the day was free of complications this year, turning up a clear-cut winner in Charles H. Emmel of Wells Mfg. Co., Skokie, Ill. Last year the prize was split three ways because of tied "Guestimates." The five castings displayed—one each of magnesium, aluminum, bronze, gray iron and steel—weighed 206 lb 6 oz. Mr. Emmel's expert appraisal was just 4 oz short of this figure.

The evening program got under way with serving of a deluxe full-course buffet dinner a la family style in the big tent erected adjacent to the clubhouse. The new procedure in serving speeded up the dinner and proved a popular change. Awarding of prizes to golf and horseshoe winners and to holders of lucky ticket stubs followed immediately after dinner. The party closed after several acts of floor show.

Arrangement and direction of the outing was by the chapter's entertainment committee headed by H. G. Schlichter, vice president and sales manager, Beardsley & Piper Division of Pettibone Mulliken Corp., and co-chairmanned by Harry D. Hunt, foundry superintendent, Pettibone Mulliken Corp.

Others serving on the committee were: Donations—Frank B. Flynn, S. Obermayer Co., and J. C. Becker, Hewitt-Robins Inc.; Golf—Albert A. Milkie, Pangborn Corp., and George Bowdish, Hill & Griffith Co.; Afternoon Entertainment—Harry C. Swanson, Arrow Pattern & Foundry Co. Inc., and J. S. Groh, Foundry Products Division, Archer-Daniels-Midland Co.; House—J. C. Gore and W. C. Kremer, Foundry Products Division, Archer-Daniels-Midland Co., and Mr. Hunt; Evening Entertainment—S. E. McGinty, Firegan Sales Co., Robert W. Meloy, Link-Belt Co., and Jack Fuqua, Calumet Steel Castings Corp. —*Erle F. Ross*

SOUTHERN CALIFORNIA Chapter of the AFS held its 16th annual outing on Aug. 15. Top view shows, left to right, Bill Baud, Mechanical Foundries Division; Tony Tuzzolino, Overton Foundry; and Ed Worth, Mechanical Foundries Lower left, left to right, are Jack Crawford and T. V. Clifton, Independent Foundry Supply Co., and Marley Oberlies and Jack Shearer, Hanford Foundry Co. Group at the lower right includes Ken D. Hoke, McGowan Co.; C. B. Callamon, Mechanical Foundries; Earl K. Appleman, A. P. Green Fire Brick Co.; Otto Rosentreter, National Engineering Co., and Paul Crow, Phillips Foundry. Photos are by courtesy of Calmo Engineering Co.

Southern California

SIXTEENTH annual outing of Southern California Chapter of the AFS was held Aug. 15 at Lakewood Country Club, Long Beach, Calif. Approximately 450 members and guests were present to enjoy the day's activities, 100 of whom participated in the golf tournament. Harold Rice took low gross honors and G. M. Jones was winner of the blind bogey. Other sporting events included horseshoe pitching and soft ball.

Tony Tuzzolino, Overton Foundry, and Bill Baud, Mechanical Foundries, with their assistants manned the barbecue stand and Pete Valentine's trio provided musical entertainment. The day was completed with a steak dinner and a variety show.

The success of the outing can be attributed to the efforts of James A. Oliva, Oliva & Tatro Co., and his committee—*Otto H. Rosentreter, National Engineering Co.*

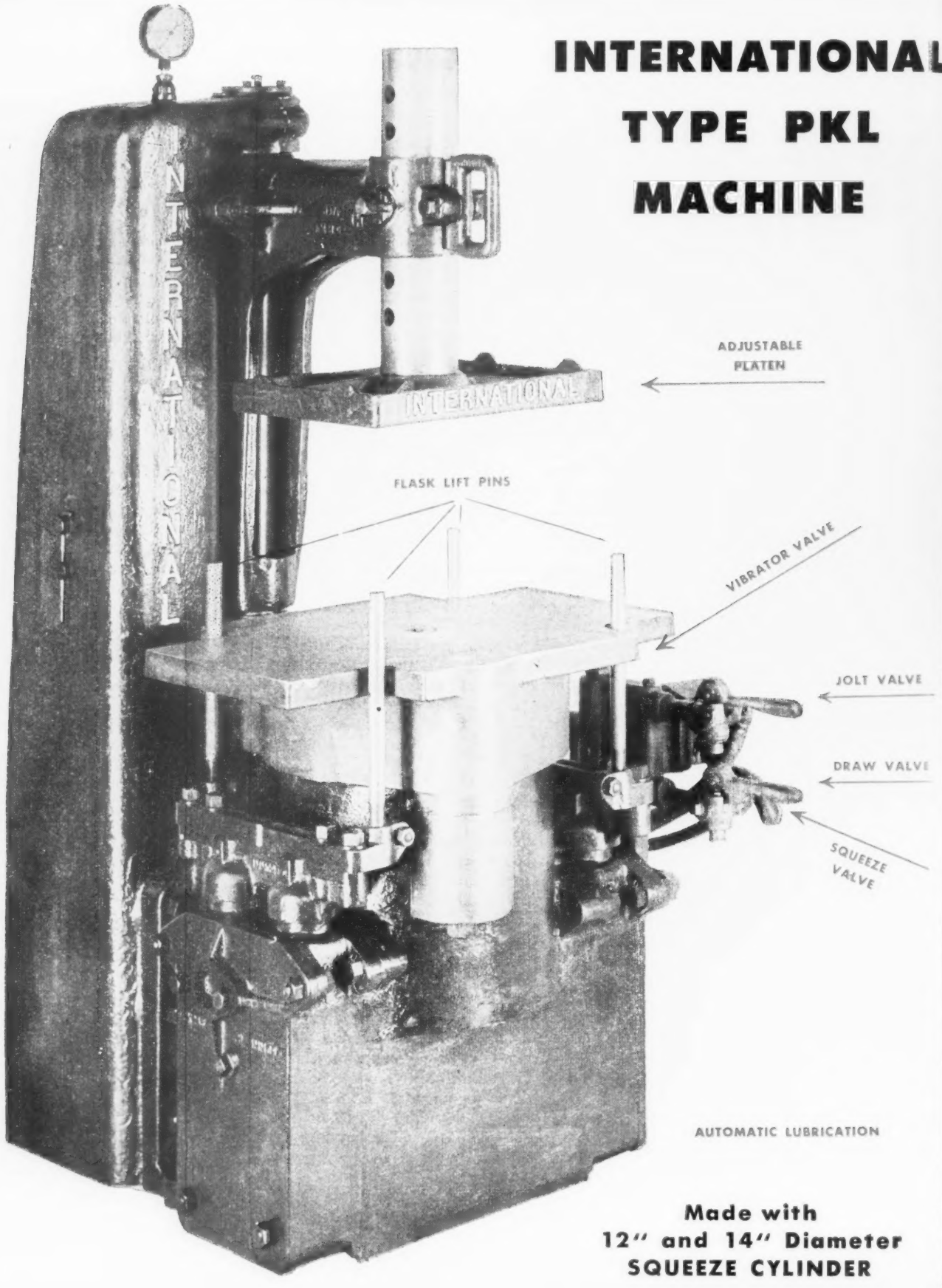
Chesapeako

A CAPACITY crowd of more than 400 members and guests of Chesapeake Chapter of AFS enjoyed the second annual crab feast and boat trip on July 18. The weather was hot and those on board enjoyed the steamed crabs, crab soup and beer. A little German band composed of employees from Chambersburg Engineering Co., Chambersburg, Pa., supplied the music. A. A. Hockrein, Federated Metals, and M. J. Kelly, Kelco Co., were co-chairmen responsible for the party's arrangements.

The chapter has announced its third annual educational program. It deals with "Casting Defects and What To Do About Them." The two-day symposium will be held Oct. 23-24 at the Engineers Club, Baltimore. Opening the symposium on Friday evening, the technical staff of the

(*Continued on page* 230)

INTERNATIONAL TYPE PKL MACHINE



Made with
12" and 14" Diameter
SQUEEZE CYLINDER

INTERNATIONAL MOLD
LA GRANGE

INTERNATIONAL TYPE PKL MACHINE

JOLT, SQUEEZE, AIR PIN LIFT

This machine is of a very rugged character. The column, squeeze head and platen are made of cast steel. The squeeze cylinder, squeeze piston, jar cylinder and jar table are made of wear-resisting iron.

All parts subject to wear have replaceable bushings of either brass or hardened steel. There is a threaded adjustment on the lower ends of the lift posts so that they can be set at the right height to suit the thickness of the pattern plates to be mounted, and the centers of the lift posts can be readily set to suit the sizes of flasks to be used,—note specifications on the following page. Type PKL comes equipped with pop valves, air gauge, vibrator and cleaner valve.

IG MACHINE COMPANY

ERK, ILLINOIS

CHESAPEAKE Chapter of the AFS held its second annual crab feast and boat trip on July 18. Over 400 persons attended, including visiting foundrymen

(*Continued from page* 227)

New Jersey Silica Sand Co. will present a paper, "What the Sand Producers of Today Are Doing to Supply Better Sands for the Castings Foundrymen Will Make Tomorrow."

On Saturday the following two papers will be presented: "How the Proper Use of Burning and Welding Will Make Your Castings More Saleable," by Linde Air Products Co.; and "Proper Selection of Grinding Wheels Will Make Your Castings More Saleable," by J. H. Hawkins, Atlantic Abrasive Wheel Co. The program concludes with the movie, "Friction Sawing as It Relates to the Foundry Industry," shown by the DoAll Co.—*Lewis H. Gross, American Radiator & Standard Sanitary Corp.*

New England

CONTINUING its series of successful regional foundry conferences, the New England Foundrymen's Association, under the chairmanship of Frank Elliot, Westinghouse Electric Corp., Springfield, Mass., has completed arrangements for the 13th annual conference on Oct. 23 and 24. Co-operating with the association is Massachusetts Institute of Technology, Cambridge, Mass., where the technical meetings will be held.

Ferrous and general sessions have been arranged by Howard B. Nye, Crompton & Knowles Loom Works, Worcester, Mass., and include discussions of recent foundry industry developments, foundry equipment maintenance, foreman training, sand control, quality control in the small foundry and cupola practice.

Frank Volpe, Somerville Machine & Foundry Co., Somerville, Mass., has arranged for talks on aspects of shell molding in nonferrous foundries, aluminum foundry practice and a discussion of nonferrous casting defects. Concluding the technical program will be a demonstration of shell molding equipment in the new MIT foundry through the courtesy of Production Pattern & Foundry Co., Chicopee, Mass.

Birdie Tebbetts, former major league baseball star and presently manager of the Indianapolis baseball club, will relate some of his baseball experiences at the conference dinner. And as has been the custom, the conference ends on Saturday night with a smoker which is arranged by the New England supply men.

Friday, Oct. 23

9 a.m.—**Registration**
10 a.m.—Address of welcome to Massachusetts Institute of Technology by Adm. C. L. Cochrane, dean of engineering, MIT
10:15 a.m.—**Ferrous session:** "A Summary of Recent Developments in the Foundry Industry," Howard H. Wilder, Vanadium Corp. of America, Detroit
10:30 a.m.—**Nonferrous session:** "Some Aspects of Shell Molding in the Nonferrous Foundry," George J. Jackson, Walworth Co., Boston
12 noon—**Lunch**
1:30 p.m.—**Maintenance of Foundry Equipment,"** George E. Miller, Osborn Mfg. Co., Cleveland
3 p.m.—**"Foreman Training in the Foundry Industry,"** John W. O'Toole, Crompton-Knowles Loom Works, Worcester, Mass.
6 p.m.—**Conference Dinner** "Baseball Experiences," George "Birdie" Tebbetts, Indianapolis baseball club manager (courtesy of Mystic Iron Works and New England Coke Co.)

Saturday, Oct. 24

8 a.m.—**Registration**
9 a.m.—**"Sand Control in Relation to Casting Finishes,"** Martin Pepper, Whitehead Bros. Co., New York
10:30 a.m.—**Ferrous session:** "Quality Control in the Small Foundry," by William J. Sommer, Plainville Casting Co., Plainville, Conn.
Nonferrous session: "Aluminum Foundry Practice," Ward D. Stewart, Aluminum Co. of America, Pittsburgh
12 noon—**Lunch**
1:30 p.m.—**Ferrous session:** "Getting the Most from your Cupola," Daniel E. Krause, Gray Iron Research Institute, Columbus, O.
Nonferrous session: "Why Castings Are Lost," William B. George, R. Lavin & Sons Inc., Chicago
3 p.m.—Shell molding machine demonstration through the courtesy of Production Pattern & Foundry Co. and MIT
5 p.m.—Conference closing

Northwestern Pennsylvania

A GRAY iron metallurgy and cupola operation course has been arranged by the Northwestern Pennsylvania Chapter of AFS. Outlined by the Mineral Industries Extension Services of Pennsylvania State College, the subjects to be covered will include cupola construction and design; refractories and operation; special cupolas and tuyere arrangements; metallic charge material and calculation; foundry coke, chemical and physical characteristics; combustion in the cupola, pyrometry for the cupola, gas analysis; fluxing materials, slags, desulphurizers; effect of desulphurizers, inoculants; ductile iron; sand control; gating and risering; analyzing casting defects.

The course will be under the direction of William Peelman, Bucyrus-Erie Co., Erie, Pa., and will consist of one 3-hour session a week extending over 24 weeks. Classes will be held in the Academy High School, Erie. Registration may be made with J. Diemert, Erie Casting Co., or at the school. There is a $3 registration fee which is returned to the student upon completion of the course.

The school is not equipped with a foundry, so to supplement the classroom instruction, there will be plant visitations arranged to watch various operations. All classes will be conducted on a lecture-discussion basis.—*Roy A. Loder, Erie Malleable Iron Co. and Bailey D. Herrington, Hickman-Williams & Co.*

Twin City

EIGHTH annual golf tournament and dinner of Twin City Chapter of the AFS was held Aug. 3 at the Midland Hills Country Club, St. Paul. Approximately 220 foundrymen and guests participated in spite of a day-long rain. Arrangements for the outing were made under the direction of J. S. Garski, president, Progress Pattern & Foundry Co.

The golf tournament began at noon and awarding of prizes followed dinner. Last year's low-gross golf winner, Paul Kordiak, Scott-Atwater Co., Minneapolis, was awarded the chapter trophy as a three-time winner. This year's low-gross champion was Paul Younger, Western Alloyed Steel Co., Minneapolis, who also received a trophy. Featured door prize was an outboard motor which was won by W. D. Murphy, Pioneer Engineering Co., Minneapolis. —*R. J. Mulligan, Archer-Daniels-Midland Co.*

Northwest Regional Will Be Held in Seattle

REGISTRATIONS for the Northwest Regional Foundry Conference to be held at the New Washington Hotel and the University of Washington, Seattle, on Oct. 16-17, may be sent to Fred R. Young, E. A. Wilcox Co., Arctic Bldg., Seattle 4.

In addition to the technical program which begins Friday afternoon

(*Continued on page* 232)

Call Us...

about your tramp iron troubles . . . we're specialists in Magnetic Separators

Homer permanent non-electric magnetic separators, are the products of specialized manufacturing — they are twenty-four hour a day watchdogs for industry, serving practically every phase in eliminating lost production, down-time and extra maintenance cost due to TRAMP IRON.

Too, they are serving many plants in manufacturing and processing industries, where it is necessary to concentrate ferrous from non-ferrous materials in any form.

If you need magnetic separation of any type, we invite you to call on us for assistance. There is no obligation to you for consultant service. The Homer Manufacturing Company, Inc., Dept. 156, Lima, Ohio.

Remember... with a HOMER you are *Certain!*

HOMER

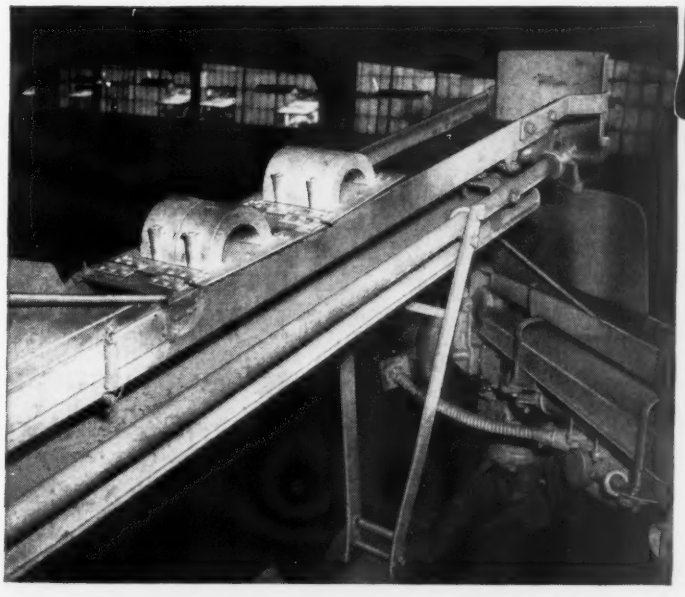


Photo at left shows two Type F HOMER permanent magnetic separators installed on a Beardsley & Piper sand slinger. These magnets were mounted on the small conveyor which feeds the slinger head. This installation was successful not only in removing damaging tramp iron, but also removed small "BB" shot which happened to be mixed with the sand. The Homer separators were also credited with the elimination of approximately $100 cost per day in repair parts and replacement labor only, and did not take into consideration production loss caused by equipment "down-time."

ALLIGATOR V-BELT DRIVES

. . . you can make up all lengths of V-Belts quickly

"B" DISPLAY UNIT

★ **Units contain V-Belting, Fasteners and Tools** — everything you need in one package for all emergencies when correct endless V-belt is not available.

★ **Avoid costly delays,** shut-downs and pickups.

★ **Eliminates costly dismantling** of machinery when re-belting.

★ **Completely modern make-up units** that give you peace of mind as well as stock on hand.

★ **Less Stretch and Follow-Up Maintenance.** Just One Strong Joint.

★ **Alligator V-Belt Drive Units,** available in sizes A, B, C and D. B size furnished in display box.

★ **Order from your distributor. Ask for Bulletin V-215.**

FLEXIBLE STEEL LACING CO.

4007 Lexington St. Chicago 44, Ill.

(*Continued from page* 230)

at the New Washington Hotel, a special field trip has been arranged to the Puget Sound Naval Shipyard at Bremerton, Wash. The ferry leaves Colman Dock, Seattle at 9 a.m., and the foundry will be operating that morning. Program giving papers and speakers appears on page 187, July issue of FOUNDRY.

Arrangements have been made to entertain the ladies during the conference, and a party inc'uding dancing, entertainment and buffet supper has been planned for Saturday evening.

Edward D. Boyle, Puget Sound Naval Shipyard is general conference chairman and James F. Dolansky, Griffin Wheel Co., is program chairman.

Hold Metals Casting Conference at Purdue

SIXTH annual Metals Casting Conference has been arranged by the Central Indiana and Michiana Chapters of AFS in co-operation with Purdue University. As in the past, the meetings will be held in the Memorial Union Building on the campus at West Lafayette, Ind., beginning at 10 a.m. on Oct. 29 and concluding on Oct. 30.

Keeping in mind the educational benefits to be gained by the exchange of ideas of those attending through contact with visiting specialists, the speakers will discuss materials handling, safety and economical production methods for quality castings.

The conference program follows:

Thursday, Oct. 29

9 a.m.—**Registration**

10 a.m.—Conference opens with welcome by W. A. Knapp, associate dean, Schools of Engineering, Purdue University. Response by Frank J. Dost, Sterling Foundry Co., Wellington, O., and vice president, AFS. **"Don't Bet Your Life,"** by Clyde R. Powell, public relations director and safety authority, Lehigh Safety Shoe Co., Endicott, N. Y. Chairman H. A. Bolz, head, Department of General Engineering, Purdue

"Herbert . . . It's easier if you turn on the air!"

MORE PIECES GROUND *per* HOUR

6-hole bearing blocks:

6 times the service

MORE PIECES GROUND PER GRINDING WHEEL LIFE

You'll speed up grinding production —get more work per hour *and* per wheel—when you dress wheels periodically with the right Desmond dresser for the job. Only Desmond makes the famous Hex Dresser, (illustrated) using Huntington-type cutters mounted in 6-hole bearing blocks which give six times the service.

The Desmond Dresser Guide—a 9" x 12" wall chart—shows the main types of dressers and when to use them, helps maintain top grinding production. Contact your Desmond distributor for free copies of the **Guide** and for all your dresser and cutter requirements . .

THE DESMOND-STEPHAN MFG., CO.
URBANA, OHIO

Desmond
DRESSERS & CUTTERS

1:30 p.m.—**Automatic Core and Mold Production,** by C. W. Hockman, foundry superintendent, Cadillac Motor Car Division, General Motors Corp., Detroit. Chairman, L. P. Lentz, assistant manager, International Harvester Co., Indianapolis

3 p.m.—**Pneumatic Sand Transfer,** by J. F. Kauffman, foundry engineer, Studebaker Corp., South Bend, Ind. Chairman, G. C. Dickey, works manager, Harrison Steel Casting Co., Attica, Ind.

6:30 p.m.—**Dinner.** Speaker Dr. Earl Butz, head, Department of Agricultural Economics, Purdue, **"Production, Progress and Prosperity."** Toastmaster, R. W. Lindley, professor of manufacturing processes, Purdue

Friday, Oct. 30

10 a.m.—**A Million Dollars of Dust Collection Equipment Won't Do a Bit of Good Unless Properly Hooded,** by K. Robinson, ventilation engineer, Industrial Hygiene Department, General Motors Corp., Detroit. Chairman, George Adler, safety director, Auto Specialties Mfg. Co., St. Joseph, Mich.

11:15 a.m.—**Some Modern Concepts of Gating and Risering,** Charles Locke, works manager, West Michigan Steel Foundry, Muskegon, Mich. Chairman, M. J. Lefler, general manager, Oliver Corp., South Bend, Ind.

1:30 p.m.—**Present Comments and Opinions Regarding the Effect of Molding Materials on Apparent Metal Shrinkage,** by Clyde A. Sanders, vice president, American Colloid Co., Chicago, and C. C. Sigerfoos, associate professor, Michigan State College, East Lansing, Mich. Chairman, R. P. Schauss, sales manager, Werner G. Smith Co., Chicago

AMA Publishes Catalog Of Its Publications

The American Management Association has published a complete catalog of its publications in eight fields of management. These include personnel, manufacturing-production, office management, marketing, financial management, insurance, general management and packaging. Also covered are research reports, other special publications and material reprinted on demand.

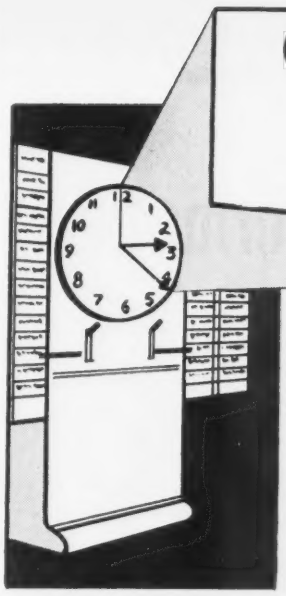
Known as *Progress in Scientific Management*, the catalog is available from the association, at 330 West 42nd St., New York 36.

Book Review

Analysis of Aluminum Alloys, by G. H. Osborn and W. Stross, cloth, 144 pages, 5½ x 8½ in., published by Chemical Publishing Co., New York. Price $3.50.

Methods of analysis surveyed range from those requiring modern physiochemical instruments such as a polarograph and photometer, to those which can be carried out with the normal equipment available in a general chemical laboratory. Every method has been tested thoroughly by extensive application in industrial laboratories, and details of procedure have been supplemented where necessary by theory.

The book lists gravimetric, volumetric, electrolytic, photometric and polarographic methods for the determination of the most common elements, such as copper, magnesium, silicon, iron, manganese, nickel, zinc, tin antimony and chromium, as well as methods for less common elements.



OUR CONVEYOR EQUIPMENT adds hours TO PRODUCTIVE TIME!

THESE ARE THE FACTS . . .

Foundries who have tried almost every means of increasing the productivity of their workers without increasing overtime are admitting that our conveyors are a surefire solution to the problem.

10% — 40% INCREASE

Reports from one of our most recent installations are that they have experienced a 30% increase in productivity since installing our equipment. *In other words . . . . in an 8 hr. day, they have created 2 hrs. 24 min. of productive time/ individual.* **WORTHWHILE?**

WRITE TODAY FOR FULL INFORMATION

NOMAD FOUNDRY EQUIPMENT

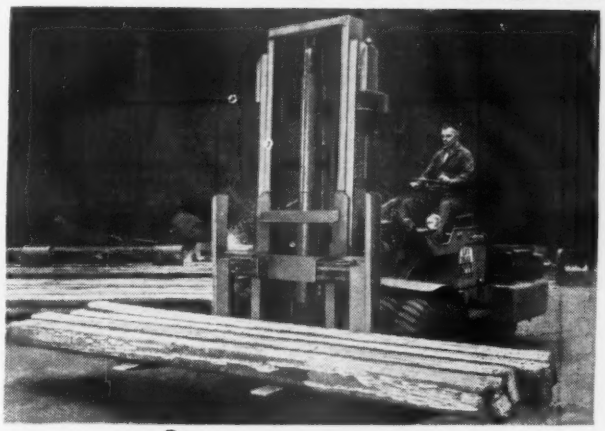
Patented · Patents Applied for

Manufactured by

WESTOVER ENGINEERS

3110 W. FOND DU LAC AVE., MILWAUKEE 10, WIS.

HEAVY INDUSTRY HARNESSES HEAVY-DUTY FORK LIFTRUK ON THE PRODUCTION LINE!



Here you see a LIFTRUK in *The Timken Roller Bearing Company* plant, Canton, Ohio, carrying a load of blooms. This is but one of hundreds of important movements required of a LIFTRUK in the metal-production fields

LIFTRUKS are available in 5 - 7½ - 10 - 15 Ton capacities. Larger sizes to order.

SEND FOR BULLETIN 77

LIFTRUK features = 1—Rugged dead axle for traction wheels. 2—Extra large elevating hydraulic cylinders. 3—Oversize engine clutch. 4—Generous sturdy construction of tiering frames and fork apron—these and other LIFTRUK features assure you of production materials handling and elimination of shut downs or slow ups.

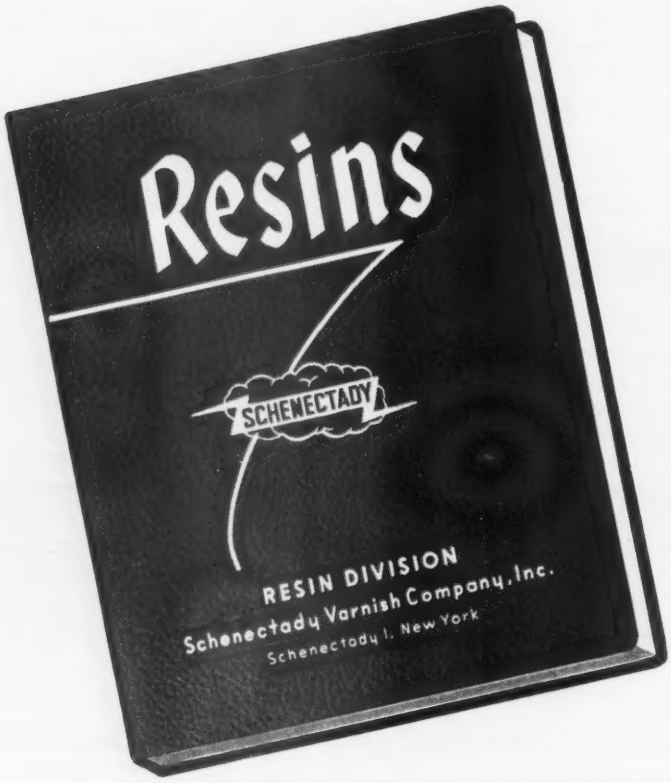
Let our sales engineers give convincing proof of LIFTRUK performance to meet *your* specific needs.

Also available with Boom, Ram, Scoop and other attachments.

SILENT HOIST & CRANE CO.

885 63rd STREET, BROOKLYN, N. Y., U. S. A.

Here is the LATEST SHELL MOLDING information



Schenectady Shell Mold Resins have earned a reputation for their excellent performance on the job. They're noted for superior hot strength, hot rigidity and fast cure while maintaining correct flow. Your local Schenectady Representative can give you all the facts.

JUST PUBLISHED BY SCHENECTADY RESINS—

a twenty four page illustrated bulletin with all the latest data on the Shell Molding Process. It describes equipment required and gives helpful hints on selecting the right resins. Mail the coupon today for your free copy.

SCHENECTADY

SCHENECTADY RESINS
Div. of Schenectady Varnish Company, Inc., 200 Congress St., Schenectady 1, N. Y.

☐ Please send me your new Shell Molding Catalog.
☐ Please have one of your representatives call.

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

Coke and Carbon Pickup

(*Concluded from page* 121)

of tests in which the iron was held for 30 minutes and presumably gave a measure of carbon saturation value of the various cokes for pure iron at approximately 3000° F.

Repeat tests on by-product coke No. c gave the values 4.87 and 4.77 per cent carbon which may be considered as excellent reproducibility.

Beehive, pitch and by-product coke No. e yielded essentially identically the same degree of carbon pickup for saturation, namely about 5.2 per cent carbon. It was anticipated that the beehive coke might give a lower value. It is of incidental interest to note that 5.2 per cent carbon content is not very different from the probable figure for saturation of the iron with respect to carbon at temperature of test.

Turning to the shorter test period of 5 minutes where the rate of carbon pick-up would be expected to assume some importance the beehive coke does give the lowest value for total carbon—2.33 per cent. By-product coke No. c again yields a low value 2.43 per cent while by-product No. e shows increasing carburizing power as indicated by the values 2.69 per cent total carbon.

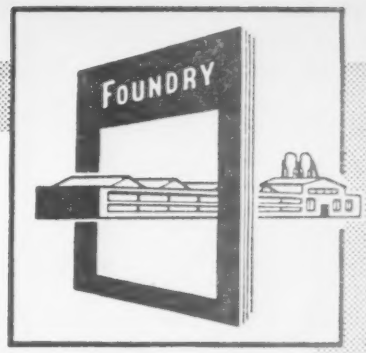
The profound increase in the rate at which the carbon in both pitch coke and Mexican graphite passes into solution in molten iron is manifest by the figures, 3.52 and 4.41 per cent, respectively, for total carbon content of the irons.

These results are noteworthy since they can be assumed to have direct application to their reaction to liquid iron in the cupola and since in general they subscribe to results observed in regular cupola practice.

Hold Office Management Conference Oct. 12-14

Reports on how 17 companies are improving their office planning will be presented to executives who attend the American Management Association's national office management conference, Oct. 12-14, at Hotel Astor, New York. Speakers will discuss such topics as human relations, cost determination, cost reduction, office machine purchasing, office electronics and work standards.

Persons attending will have the opportunity to view manuals, charts, reports and forms from a number of AMA member companies. Special displays will illustrate Prudential Insurance Co. of America's quality improvement program, Old Colony Envelope Co.'s work simplification program and Milwaukee Gas Light Co.'s service manual and office operations.



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Write the name of the advertiser and the page number of the ad in the spaces provided. Check the type of information you want. After you have finished going through this issue of FOUNDRY and have jotted down all of the ads on which you'd like more information, just tear out the card, drop it in the mail. We'll do the rest.

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BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

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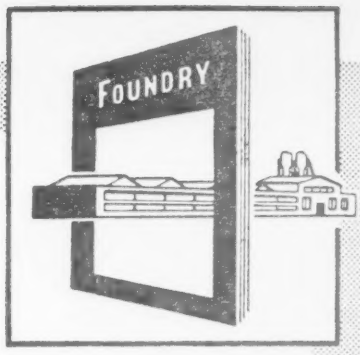
10-53



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YOUR NAME _____ TITLE _____

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10-53

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FOUNDRY
Penton Building
Cleveland 13, Ohio

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Write the name of the advertiser and the page number of the ad in the spaces provided. Check the type of information you want. After you have finished going through this issue of FOUNDRY and have jotted down all of the ads on which you'd like more information, just tear out the card, drop it in the mail. We'll do the rest.

Our staff will forward this information to the advertiser immediately so you'll be relieved of the necessity of writing several letters. You'll hear from the advertiser directly, answering your request.

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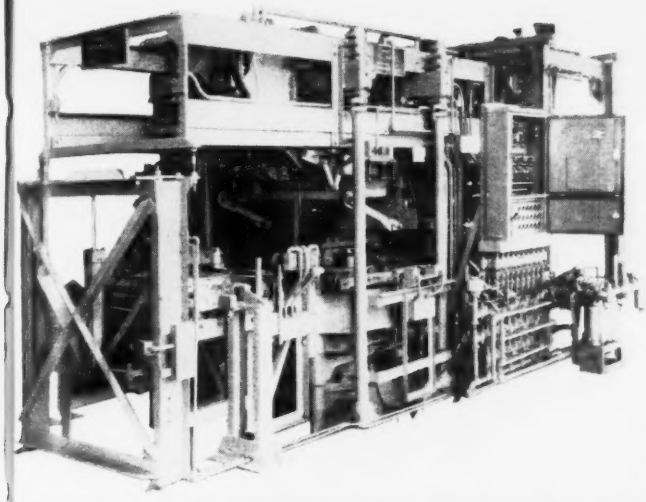


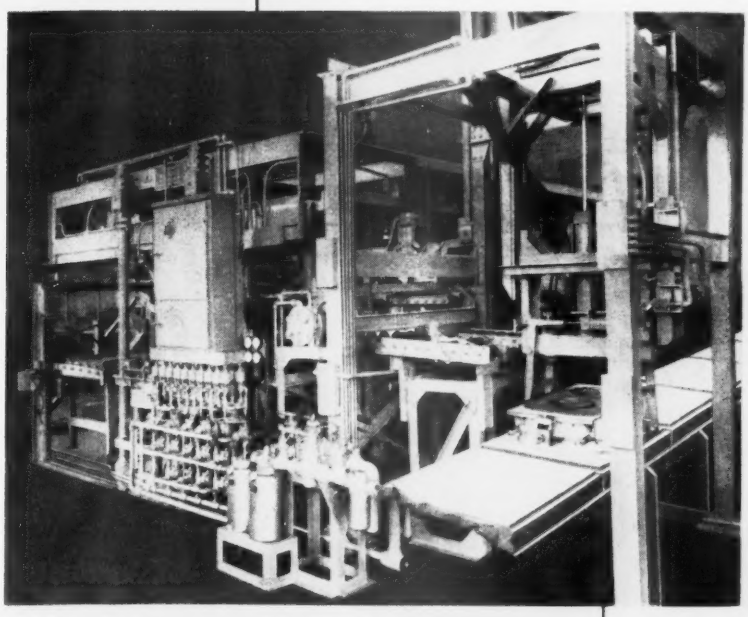
SHOWS FLASK ON FEED-IN ELEVATOR

"Push-Button" Operation Means The Ultimate in

INCREASED PRODUCTION . . .

ECONOMY . . .

QUALITY MOLDS



SHOWS COMPLETED MOLD AFTER BEING TURNED OVER, AUTOMATICALLY TRANSFERRED TO MOLD CONVEYOR

Every Nicholls Molding Machine is precision-built to insure the production of *continuously* better molds. They eliminate guess-work and costly mistakes. They put an end to dangerous risks. They effect major savings in materials and maintenance costs.

This new #24 type C machine has a pneumatic pattern draw, is equipped with an air-operated car type squeeze head, built-in flask roll-in, roll-out device and a measuring sand hopper. Other Nicholls advantages include a flask indexing device and sand spill upset; flask feed-in elevator; mold turnover and transfer... PLUS full "push-button" automatic operation.

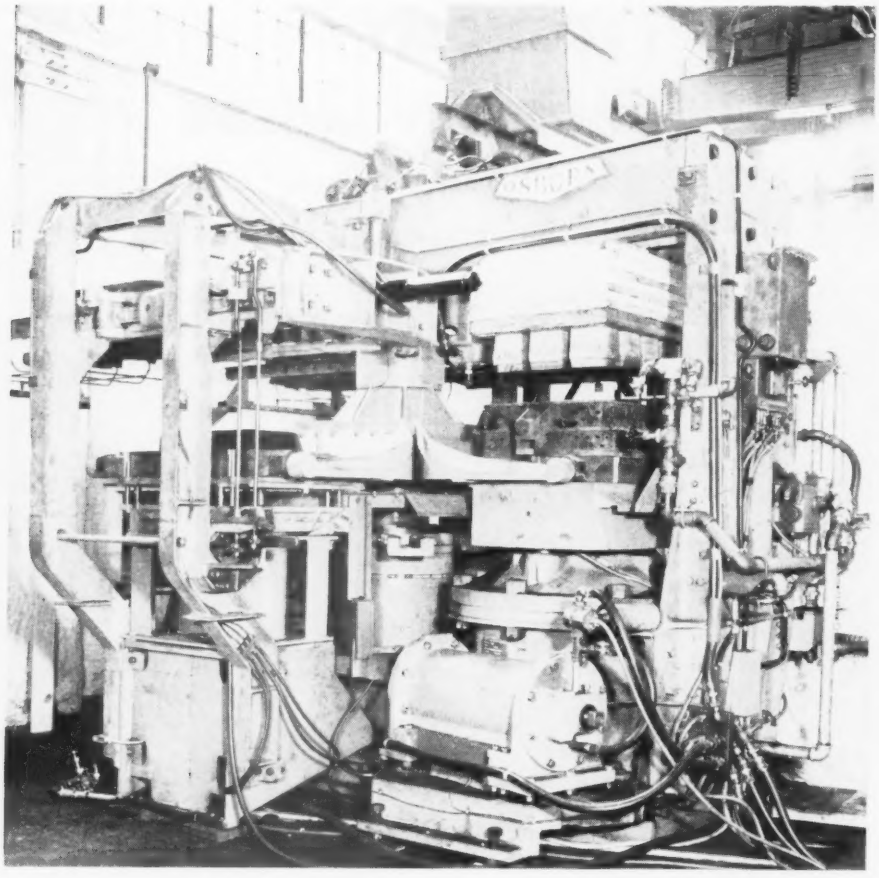
William H. Nicholls Co., Inc., Richmond Hill 18, Long Island, N. Y.

Always rely on "Nicholls" for the best in heavy-duty molding machines

NICHOLLS

Automatic Molding Machine Operates on Rotary Principle

By LEON F. MILLER
Vice President, Machine Division
Osborn Mfg. Co., Cleveland



Left—The completed machine prior to shipment. Pattern used on tests was wood mock-up, other equipment standard

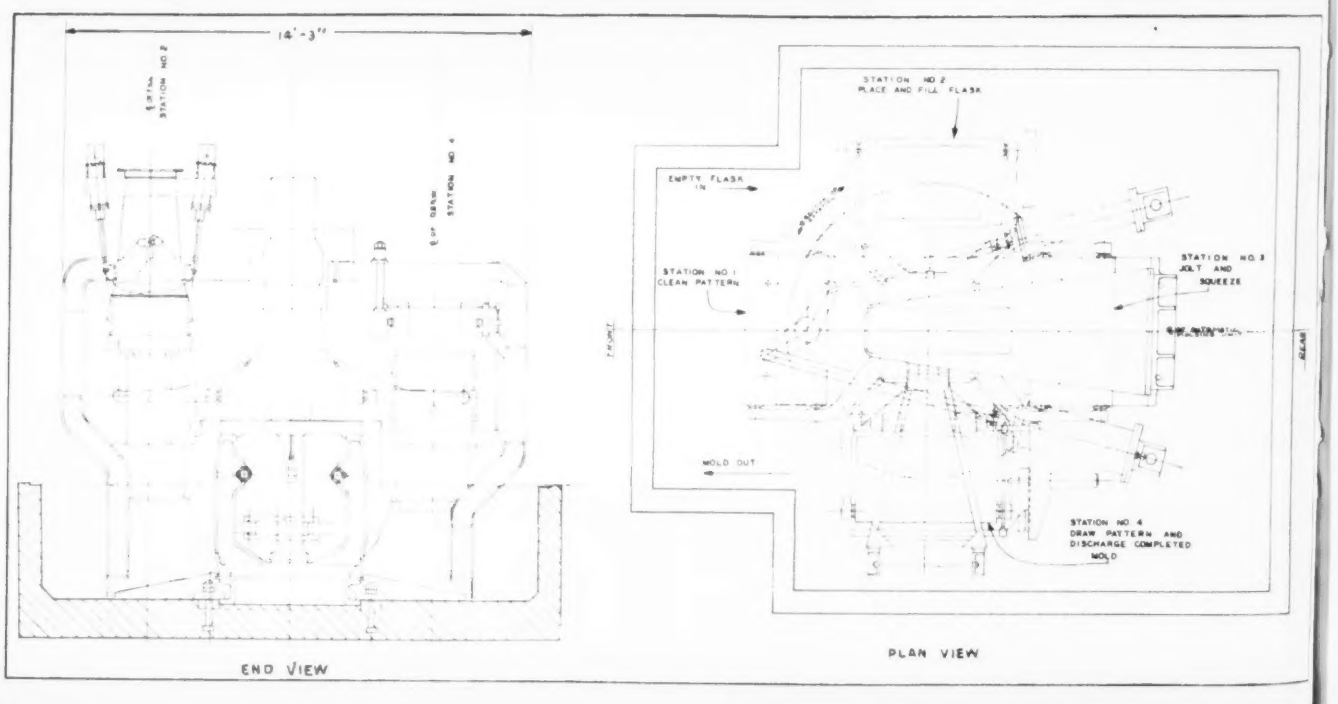
A NEW rotary automatic molding machine has been developed by the Osborn Mfg. Co., Cleveland, and the first unit is being placed in operation in a leading automotive foundry to produce cylinder block molds.

Development tests indicate that the machine will be capable of producing 240 cylinder block half molds per hour and shallower molds at rates up to 300 halves per hour. The unit, measuring approximately 13 x 14 ft and 9 ft high, weighs approximately 40 tons.

The main requirements for this machine were highest possible production at a set predetermined rate, together with uniform product quality, which included the closest pos-

(*Continued on page* 240)

Below—End and plan views of the unit. Operations are performed automatically at each of four individual stations



Mr. Production is high man...

Illustration: Mr. George Garvey of City Pattern and Foundry, South Bend, Indiana observing the checking of an "ACCURATE" cope and drag set for an M. B. Skinner Co. 12" split coupling used for repairing broken cast iron mains.

WITH ACCURATE PRESSURE CAST COPE AND DRAG SETS

QUICK DELIVERY

By Air Freight, Parcel Post, Special Delivery or Railway Express. Pick-up and delivery by jobber representatives in the following areas:

AUBURN, MASS.
Henry A. Kottmann
Telephone: Auburn 2683

MILWAUKEE, WIS.
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Telephone: HIlltop 2-7130

NORMAL, ILL.
Clarence C. Schmidlin
Telephone: Normal 8551-5

LOS ANGELES, CALIF.
McGowan Company, Inc.
Telephone: Trinity 2057

DETROIT, MICH.
Harry H. Brown,
Telephone: Midwest 4-8300
(Res. Birmingham, Mich.)

Foundries everywhere are looking for means to increase production and lower their costs. ACCURATE cope and drag sets have helped to solve this problem for hundreds of the leading foundries from coast to coast.

ACCURATE cope and drag sets have clean smooth partings and patterns as cast, are straightened, and have alignment points. This will substantially reduce your finishing costs.

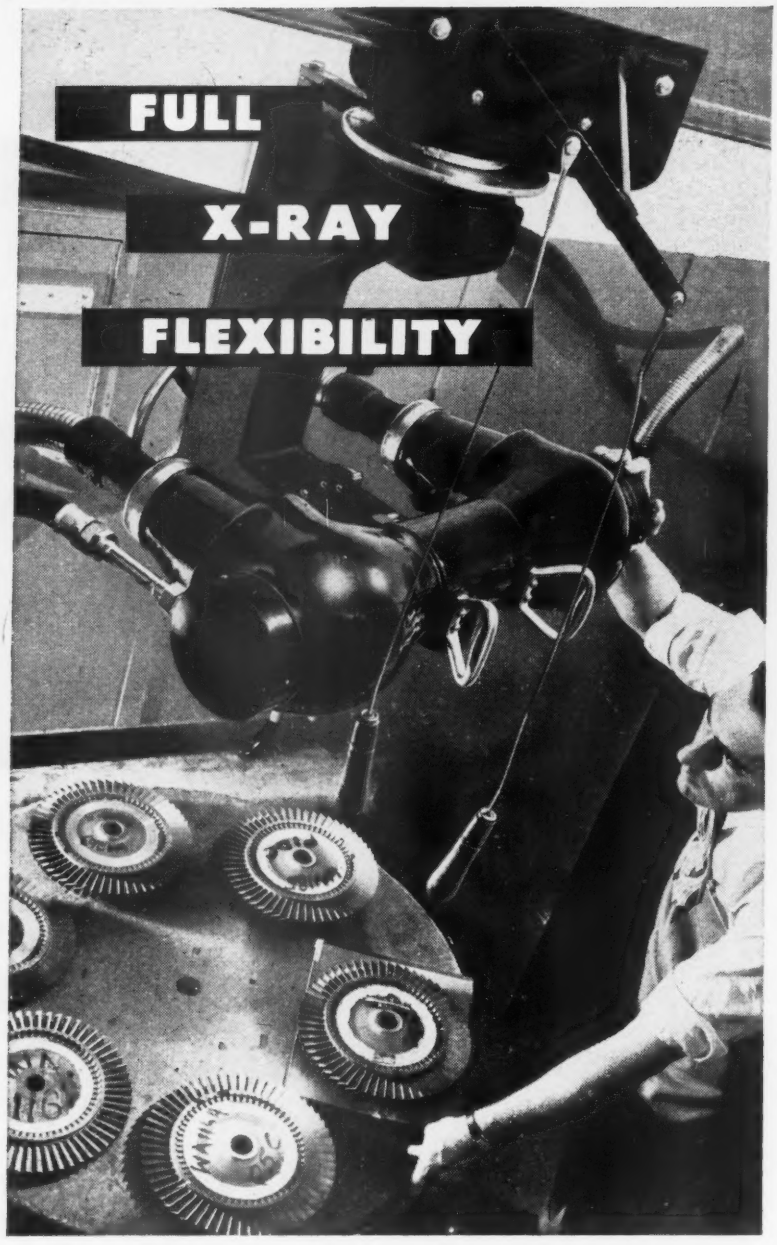
Maximum over-all plate dimensions for cope and drag sets are 54" x 64" and 48" x 80".

Why not use this profit making idea in your foundry? Write for catalog No. 515.

ACCURATE MATCH PLATE COMPANY

1847 WEST CARROLL AVENUE CHICAGO 12, ILLINOIS

Telephone SEeley 3-7918



WESTINGHOUSE 250 KV JIB CRANE X-RAY UNIT

Curtiss-Wright uses Westinghouse X-ray equipment for nondestructive testing of vital parts of their outstanding aircraft engines. Here, they're examining critical welds on gas turbine booster rotors. Prime reason for selection of Westinghouse equipment was *flexibility*—since *flexibility* results in more radiographs per shift.

Kilovoltage on this unit varies from 30 to 250, with greater X-ray output per KV because of constant potential high voltage generator. Result: unit is capable of inspecting materials ranging from 1/8" aluminum to 4" steel.

Jib crane tubestand and X-ray tubehead flexibility allows maximum ease of positioning in radiographing parts of all sizes and shapes. Result: time is saved, output is stepped up.

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(*Continued from page 238*)

sible dimensional tolerances of the castings produced. This is of increasing importance since, due to the limited finish allowances permitted, automatic equipment is more widely applied to the machining of castings. To meet these requirements demanded a highly mechanized molding operation under completely automatic control.

The author shown with machine in background. Flask at upper right holds completed half mold

The new machine has four stations at which the major molding operations are performed. A half pattern is mounted on a platen at each of the four stations. The platens float in the turntable and can be raised at each station to permit the various operations to be performed. At station No. 2, the flask in which the mold is to be rammed is automatically transferred on rollers into position beneath the sand supply hopper and directly over the platen. The platen carrying the pattern is then raised by pneumatic pistons until the flask is in position on the pattern. The gate on the sand supply hopper is then opened until the flask is filled. Next, the platen carrying the pattern, flask and sand is returned to position ready for indexing to the next station.

While the above operation is taking place at station No. 2, a flask which has previously been loaded as above is given a predetermined number of jolts and then squeezed at station No. 3. Both jolt and squeeze are performed by pneumatic pistons. While a flask is being loaded and filled at station No. 2 and another is being jolted and squeezed at station No. 3, a third flask containing a rammed mold is being drawn from the pattern at station No. 4. The elevating mechanism for accomplishing the draw operation is similar to

that used at loading station No. 2. At the finish of the draw operation, the completed mold rests on rollers and is discharged from the machine by means of a pneumatic piston.

The operations at stations Nos. 2, 3, and 4 are performed simultaneously and are automatically controlled through a drum switch which actuates solenoid valves controlling each of the operations. Interlocking limit switches are provided at all points where necessary to insure safety in the equipment's operation.

The turntable which carries the pattern and flask in a clockwise direction through each station is actuated by an indexing mechanism which uses a modified Geneva motion. The Geneva motion provides the desired high-speed operation with smooth starting and stopping. Under normal conditions, no manual operations are needed in making the mold.

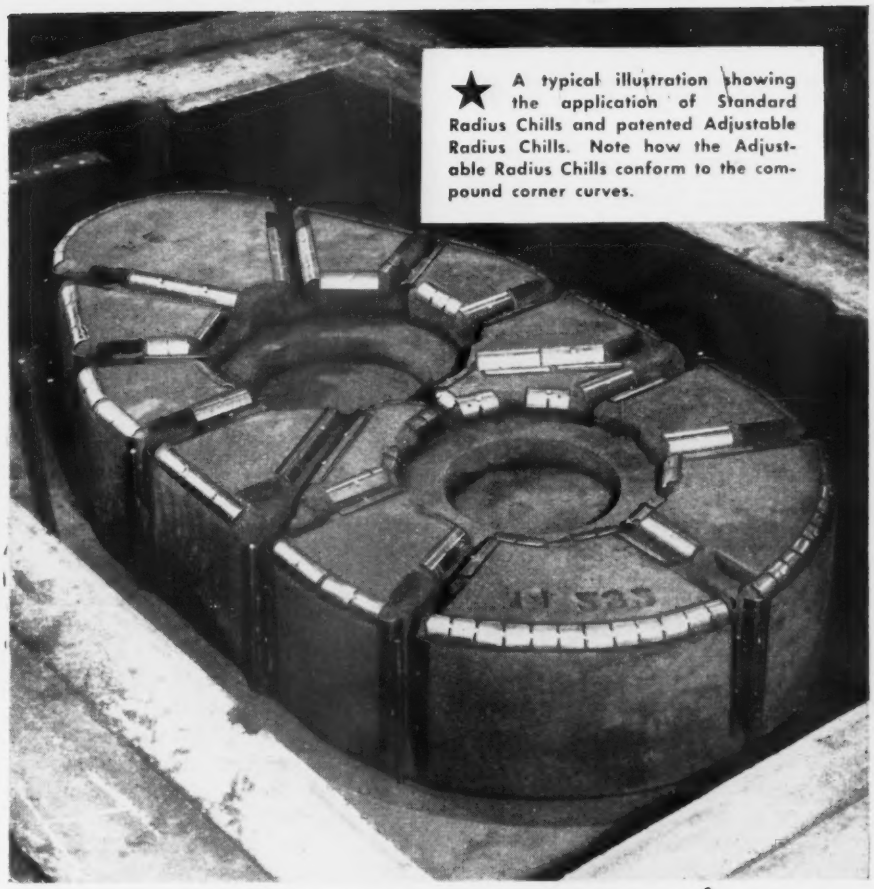
Two of these machines are used in the production of cylinder blocks—one for making the cope and the other for making the drag. Each machine consumes approximately 120,000 pounds of sand per hour.

Book Review

Metallurgy of the Rarer Metals, paper, 156 pages, 5½ x 8½ in., published by the Institution of Metallurgists, 4 Grosvenor Gardens, London S.W. 1, England. Price 15s 6 d.

This comprises eight lectures presented at the Institution's refresher course held in 1952. Metals discussed and the lecturers—outstanding British metallurgists—include "Uranium" by L. Rotherham; "Beryllium" by B. A. Scott; "Molybdenum" by L. Northcott; "Tungsten" by I. Jenkins; "Titanium and Zirconium" by J. W. Rodgers; "Tantalum and Niobium (columbium)" by J. C. Chaston; "Chromium and Manganese" by E. A. G. Liddiard, and the "Platinum Group" by E. C. Rhodes.

"No—as I see it, Boss, with your dough and my brains. . ."



★ A typical illustration showing the application of Standard Radius Chills and patented Adjustable Radius Chills. Note how the Adjustable Radius Chills conform to the compound corner curves.

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Mold Design for Casting Steel in Sand

Foundry processes employed in the making of steel castings have been studied with increasing scientific interest in recent years. This report, released by the U. S. Department of Commerce, condenses some of the literature covering new methods used in feeding large steel castings, including pressure feeding, Williams and atmospheric style risers, necked-down and knock-off risers, and the use of exothermic materials. Additional copies of the report may be secured on request from the Office of Technical Services, U. S. Department of Commerce, Washington 25, at a cost of 25 cents each.

By ROY W. TINDULA
Chief, Metals and Minerals Section
Office of Technical Services
U. S. Department of Commerce
Washington

STEEL foundry processes have been studied with increasing scientific interest in recent years with the purpose of improving internal density, control of dimensions closer to the finished form, and attainment of longer service life of the castings. This summary includes reports which deal with changes in designs of molds for steel castings. While the quality of castings also depends greatly on the practices and materials employed in metal melting and in sand molding, these factors have been described extensively elsewhere in the technical literature.

Gates for Steel Castings—Motion pictures taken in natural color and described by Johnson and Baker[1] show that the flow of molten steel within a mold cavity is governed by changes in size and location of the gates. Mold arrangements using finger gates, step gates, whirl gates, riser gates, and direct top-pouring were studied. The amount of turbulence in the entering metal stream and the motion of metal within the mold cavity was shown to be controllable by varying the gate design.

Another motion picture study reported by Johnson, Baker, and Pellini[2] shows that special sprue or gate designs which absorb momentum of the metal stream are effective in producing either a quiet, steady flow of metal in the horizontal plane in a multiple finger gating system or a quiet sequence flow in the desired order in a vertical plane using a step gating system.

A third motion picture study by Johnson, Bishop, and Pellini at the Naval Research Laboratory, Washington[3] compares the effects of various shapes of gates on the uniformity, turbulence, and velocity of entry of metal into the mold cavity.

A final report by Johnson, Bishop, and Pellini[4] compares the surface appearance, internal soundness of 6 x 12 x 2-in. steel plates cast in the horizontal position by use of several gating systems. While no defects characteristic of the systems were found in these thick steel castings, similar castings in aluminum alloy or in manganese bronze had fewer surface imperfections when a mild choke gating system was used than when overchoked or unchoked systems were used.

Loan prints of four colored 16 mm motion pictures which illustrate the above experimental tests in finger gates or other systems are available from the Office of Technical Services. These films were assembled in connection with the above researches conducted at the Naval Research Laboratory, Washington.

Janco[11] as an example of calculations for size and number of gates suggested that five 1⅜-in. round or square gates be used to feed cast rings of 24 to 30-in. diam. The cross section of these rings was 1 x 2-in. and rectangular.

Elliott and Mezoff[12] showed that skim gates are useful in controlling turbulence when casting magnesium. The use of these gates reduces the number of skin, blow, and microporosity defects.

Swift, Jackson, and Eastwood[13] employed models constructed of transparent materials with low melting alloys. They developed methods of avoiding the entrapment of air in the gating system.

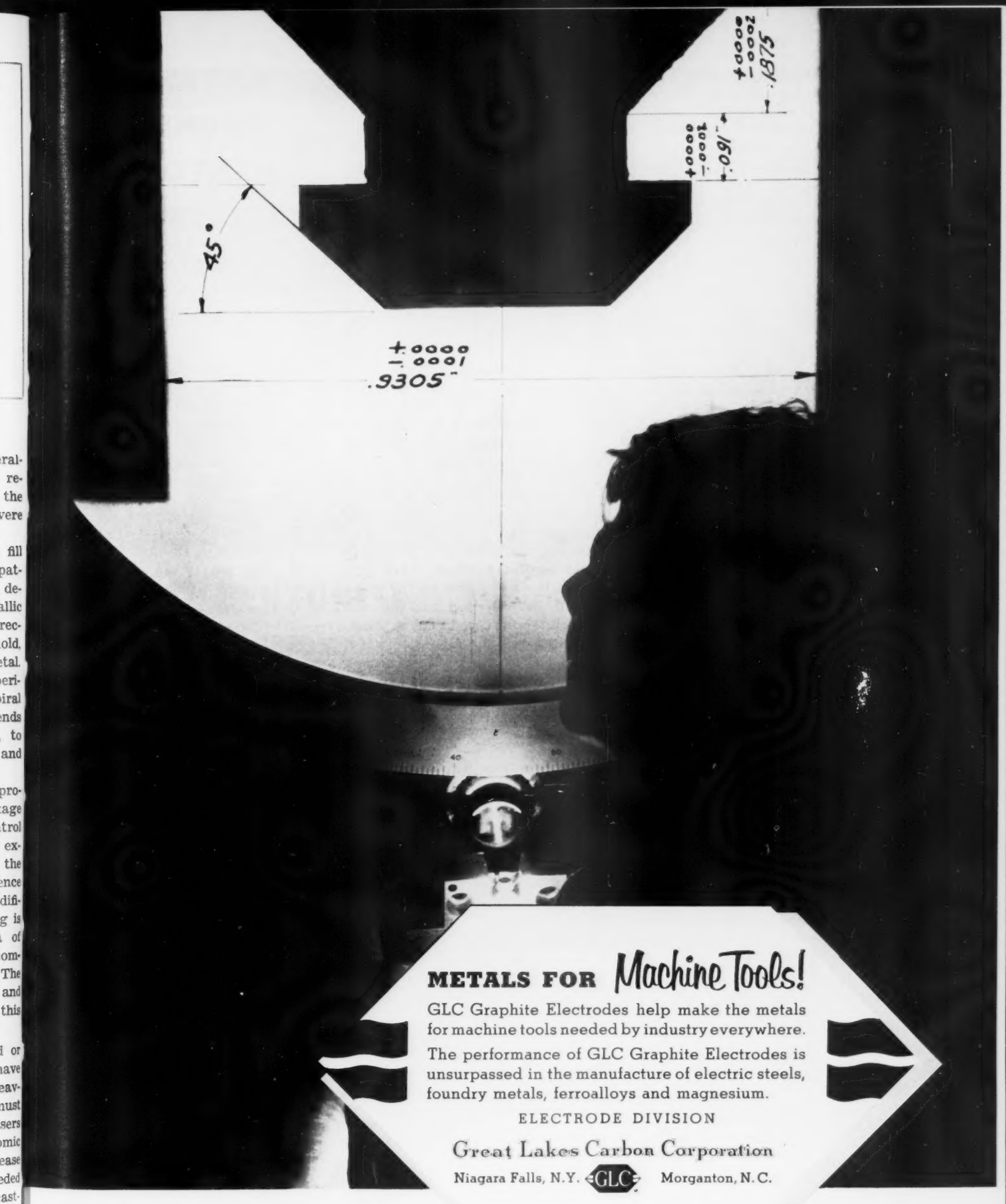
George[14] employed choked sprues and baked sand cores having several small holes for the purpose of removing dross in gating systems for casting tin bronze or red brass. These devices also are employed for making some steel castings but less choking or larger core holes generally are employed. Other recent reports on the design of gates and the rate of flow of molten metal were given in references[15] to [21].

The ability of molten steel to fill thin casting sections and reveal pattern details and corners sharply depends on freedom from nonmetallic impurities, on rate of flow and direction of the metal stream in the mold, and upon the fluidity of the metal. Fluidity may be measured experimentally by a standard fluidity spiral mold. The relative fluidity depends chiefly on the temperature and, to a lesser degree, upon the carbon and alloy content of the steel[22, 23].

Risers for Steel Castings—The production of castings free of shrinkage cavities requires directional control of sequence of freezing from the extremities with least thickness, to the heaviest sections, and from thence into the risers. The rate of solidification of each part of the casting is determined by the surface area of the adjoining mold wall exposed compared to the volume of metal. The metal evolves heat as it freezes and the adjoining mold walls absorb this heat.

Unless the risers are insulated or externally heated, they need to have thicker cross sections than the heaviest casting section which they must feed. The number and size of risers is limited in practice by economic considerations, since they increase the weight of molten metal needed to produce a given weight of casting. Risers of otherwise correct proportions will fail to feed if the connection to the casting is too small. the connection then freezes before the whole casting is solid. The pressure existing in the riser also must be somewhat higher than that

(*Continued on page* 244)



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(*Continued from page 242*)
existing in the highest point of the casting which it must feed.

Removal of risers from steel castings may be done with an oxygen cutting torch, but this requires expensive grinding and often welding operations to produce the required dimensions at the connection. In order to reduce finishing costs, castings often are made by placing a thin refractory or baked sand core at the riser connection. This thin core has a small central hole. The thin core is heated rapidly as the molten steel flows through the hole. The metal in the riser and connection should not freeze until the casting is completely solid. The thin connection between riser and casting permits removal of the riser from most castings by striking with a heavy hammer. The parts of this system are known as knock-off- or necked-down-risers, and Washburn cores.

Control Solidification

In addition to recent advances in methods for improving efficiency and reducing cost of removing risers, other research has been directed to the control of solidification within the casting itself. The aim in this work has been to prevent the formation of secondary or microshrinkage cavities along the central plane of the casting. Elimination of these cavities may increase the physical properties or the pressure tightness of steel castings.

Some of the reports bearing on the following phases of riser and mold design will be listed or briefly summarized:

(a) Risers feeding by atmospheric pressure
(b) Dimensions of efficient risers
(c) Application of external pressure to risers
(d) Exothermic and insulating materials in risers
(e) Necked-down risers
(f) Solidification studies of casting sections

A comprehensive summary of research and development work, as well as commercial practices, in the manufacture of steel castings was published in book form by C. W Briggs[24] in 1946. Early studies on the rate of solidification of steel in sand molds were conducted by Briggs and Gezelius[25] at the Naval Research Laboratory, by dumping castings at different time intervals after filling molds.

The Williams patent[26] describes use of atmospheric pressure to assist the action of risers feeding steel castings. Hollow core rods which extend into the center of blind risers, or shrink bobs, permit atmospheric pressure to enter the shrinkage cavity formed as the metal freezes.

Taylor and Rominski[27, 27a] experimentally determined the mechanism by which a blind riser can feed metal in a casting above its own level. In the sequence of freezing, a shell of solidified metal forms in the riser in contact with the molding sand. A vacuum forms inside both the casting and the riser as they solidify if there is no opening to the atmosphere. This condition will prevent proper feeding of the casting. By providing a porous sand core or other means of access of air at atmospheric pressure into the riser cavity, a vacuum will not form in the riser. As long as the connection to the casting remains fluid, such an atmospheric riser can feed metal above its own level to form a ferrostatic head equivalent to atmospheric pressure. This head may be as high as 54 in.

Savings in amount of metal required for open risers have been claimed by Vosburgh[28] by the use of graphite rods inserted into the riser. An undesirable condition in which the metal contains higher than normal carbon contents will occur however under the shrinkage cavity in the riser. Care must be taken that this region does not extend down into the casting.

Advocates Side Risers

Blind risers or whirl gates attached to the sides of castings were claimed by Gray[29] to permit feeding over a greater area in horizontal castings than when open risers were used at the top of the castings. This was especially true with metal thicknesses less than 3 in.

Sefing[30] listed the following factors which assist the feeding of open risers: Use of riser sections larger than those in the casting, gating hottest metal into the riser, maintaining the riser open to the atmosphere, and using risers high enough to provide sufficient pressure to all parts of the casting.

As a result of extensive researches and trials on commercial castings by members of the Steel Founders Society of America, Caine[32] proposed a formula which makes the minimum ratio of volume of riser to casting dependent upon a complicated factor which includes the surface area and volume of both casting and riser.

The riser size required to avoid formation of a shrinkage cavity must be such that the surface area to volume ratio of the casting always

(*Continued on page 246*)

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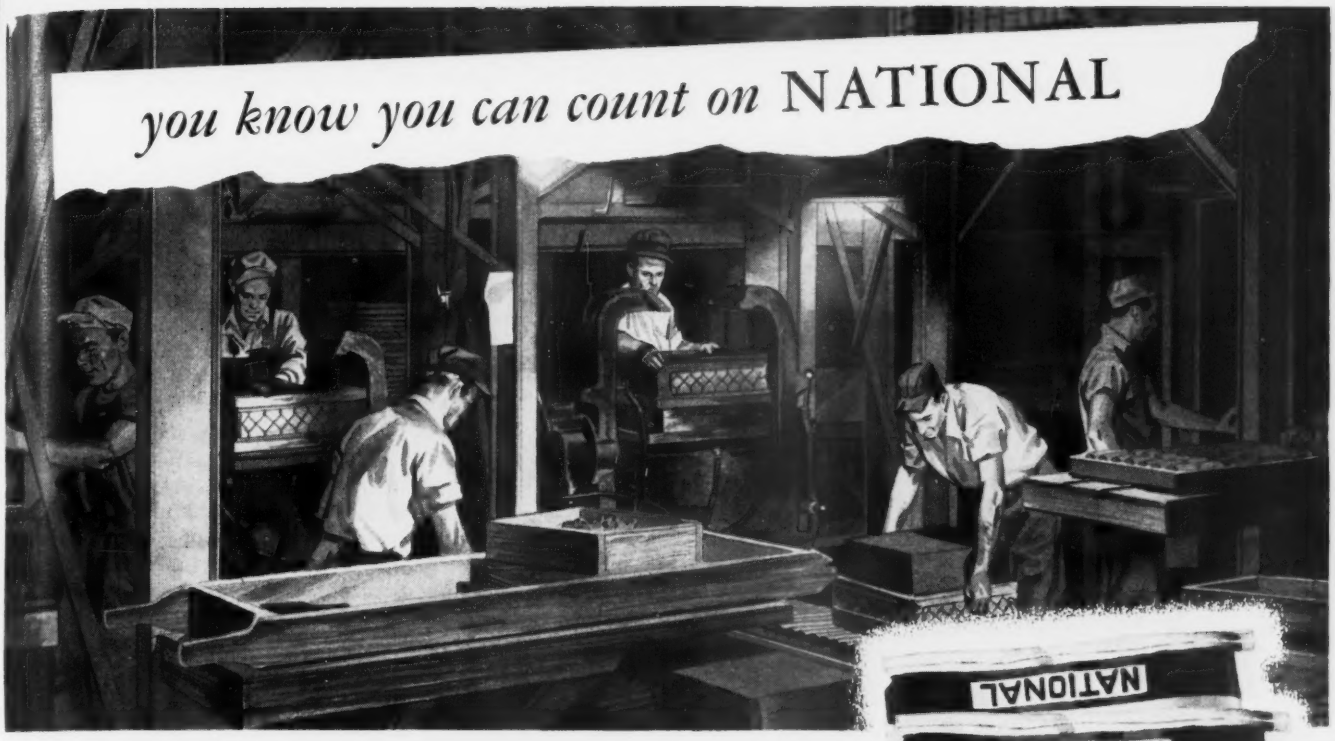

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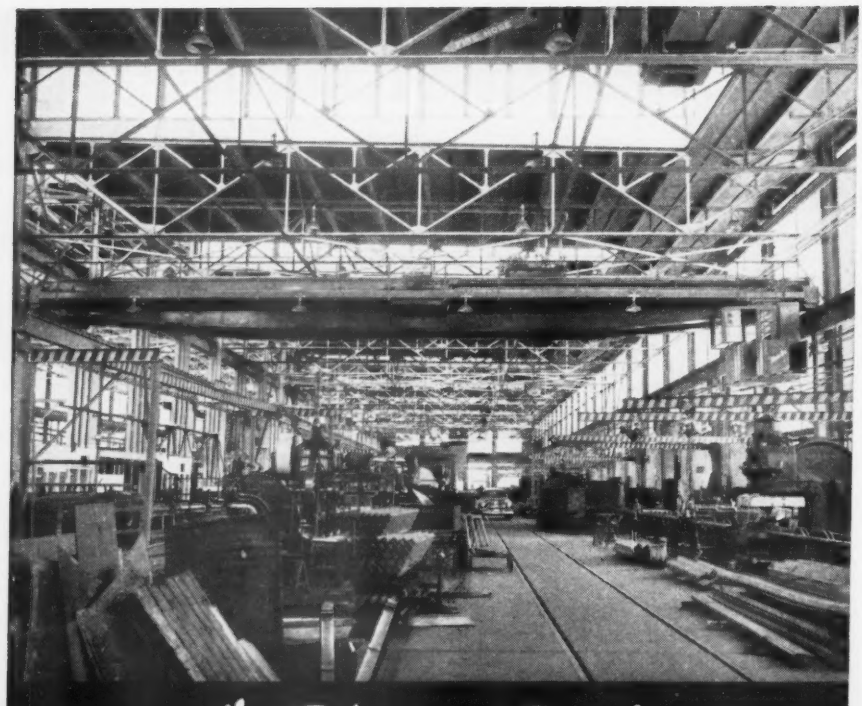

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(*Continued from page* 244)

is greater than the surface area to volume ratio of the riser in order that the casting will freeze earlier. The volume of the riser must also be great enough to meet the volume shrinkage demands of the casting.[33, 35]

Hyperatmospheric Pressure Risers—Higher casting yields were claimed by S. T. Jazwinski and S. L. Finch[36] and said[37] to be obtainable by raising the gas pressure within the riser to higher than atmospheric pressure. This was done by molding a gas and heat developing material within the riser cavity. Other experiments using higher than atmospheric pressures in risers without however increasing the heat input did not improve the feeding of steel castings, according to Myskowski, Taylor, and Gezelius[38].

Exothermic and Insulated Risers—Antipiping compounds now have been used for many years as a means of slowing down the freezing rate of risers on steel castings. Such compounds with exothermic materials were found by Gertsman[39] to reduce the extent of the primary shrinkage cavity in cylindrical steel castings. A method thus was outlined for measurement of the relative efficiency of antipiping compounds.

Additions of alloying agents containing thermite were reported[40, 41, 42] to enable very short risers to be employed on steel castings. These materials are added to the metal in the riser after a short waiting period after filling the mold. This addition is timed to meet the late feeding demand of the casting for metal from the riser.

Insulating compounds and riser sleeves were experimentally used by Taylor and Wick[43] for bronze castings and by Boyle[44] for bronze and aluminum castings as a means of decreasing the size of risers required. Gypsum plaster[43] and diatomaceous earth-bentonite-resin mixtures[44] were the insulating materials used in these experiments. These pads or sleeves were molded in place around the riser cavity. They kept the metal in the riser fluid for a longer time because they are poorer heat conductors than are the foundry sands used in the rest of the mold. Gypsum cannot be employed in this way for iron or steel castings, since it reacts chemically with ferrous metal when molten.

Power[10] used riser sleeves formed by compressing mixtures of coarse sawdust and dextrin. The inside surfaces of the sleeves were coated with silica flour before use. Some success was obtained by using these sleeves to decrease the size of risers required for gray iron and steel castings. In

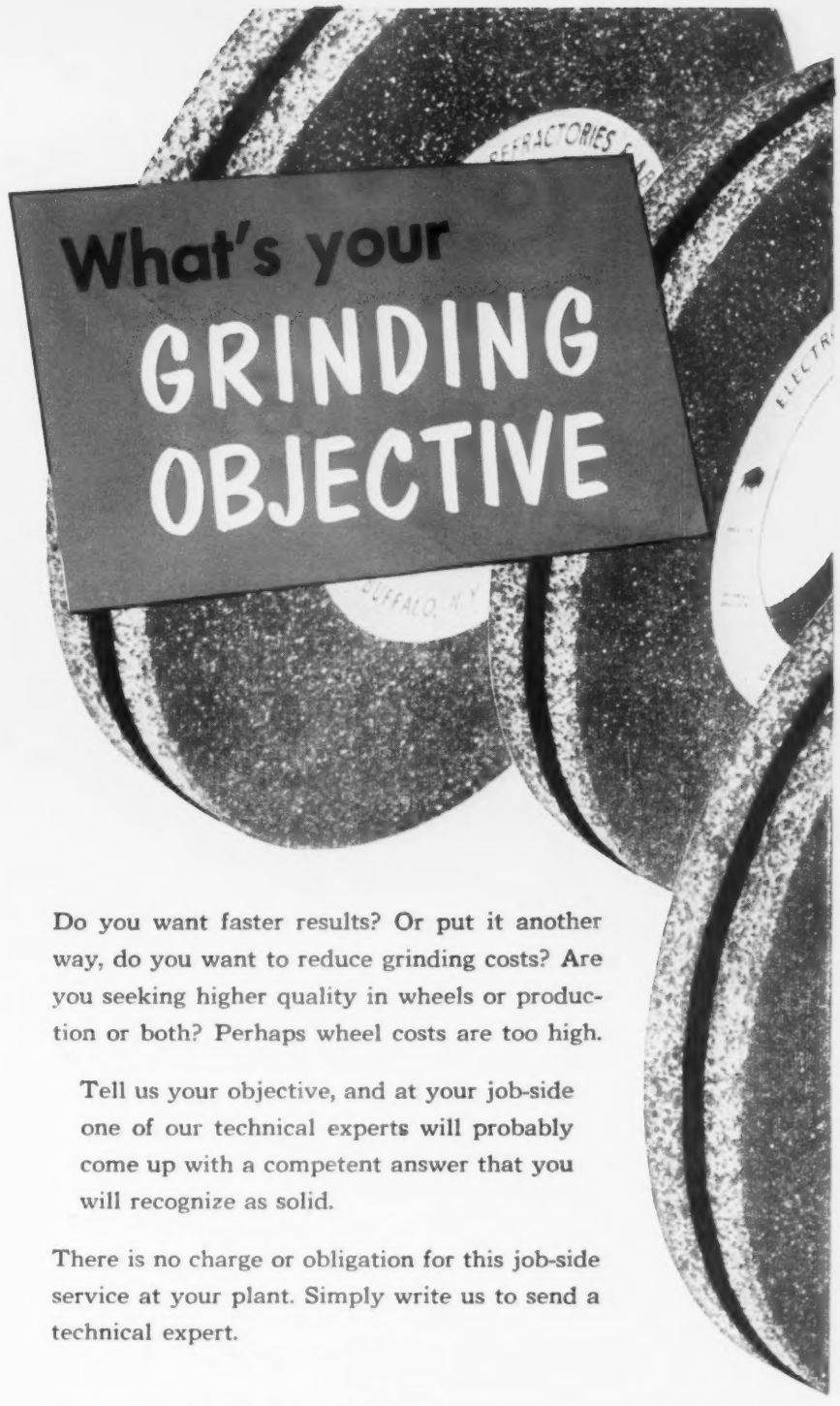
many cases, however, the metal broke through the silica-flour coating and then reacted with the sleeves, causing the castings to be porous and defective.

Beam[45] used exothermic materials in the form of sleeves and cores for casting stainless steel. Howson[46] placed insulating slabs composed of vermiculite and hollow tile around risers for steel castings. These materials reduced the required riser size and as a consequence, increased casting yield.

The use of exothermic or insulating materials in and around risers is most effective for the larger and more compact castings which have low surface-to-volume ratio. These castings have a longer time of feed demand during the solidification of the metal. These exothermic or insulating materials increase the mold material and preparation cost, and thus may cancel any savings in melting costs which they produce by reducing the size of risers. Comparisons of metallurgical factors and production costs in large and medium size steel castings for regular and exothermic risers were made by Wyman, Willey, and O'Brien[47].

Risers — Necked-Down — Necked-down or Washburn cores, developed in 1908 by E. C. Washburn, are used extensively in American steel foundries to reduce the cost of grinding and finishing at points of connection of risers and castings. In most cases the risers are to be removed from the castings, before heat-treatment, by knocking them off with a sledge hammer. These cores are commonly ¼-in. or greater in thickness. The size of the central hole, or neck diameter, must be increased with increase in core thickness to avoid formation of shrinkage cavities in the casting. A relationship between neck diameter and core thickness was determined experimentally by the Steel Founders' Society in their Research Reports 6, April 1945, and 11, 1947. The use of ceramic plates instead of baked sand cores was studied by Gray[48].

Bishop and Fritz[49] reported the occurrence of higher carbon segregated regions in small plate, and cylindrical-shaped castings with reduced diameters at riser contacts. The area at the contacts was reduced greatly to facilitate breaking off the riser from the casting. Liquid metal of higher carbon content segregates during latter stages of freezing of the contact zone. This material runs down into the casting to form the segregated zone. Samples for chemical analysis contained up to 0.58 per cent carbon at the segregated area in steel castings averaging 0.30 per cent carbon. The amount of carbon segregation increased as the neck di-



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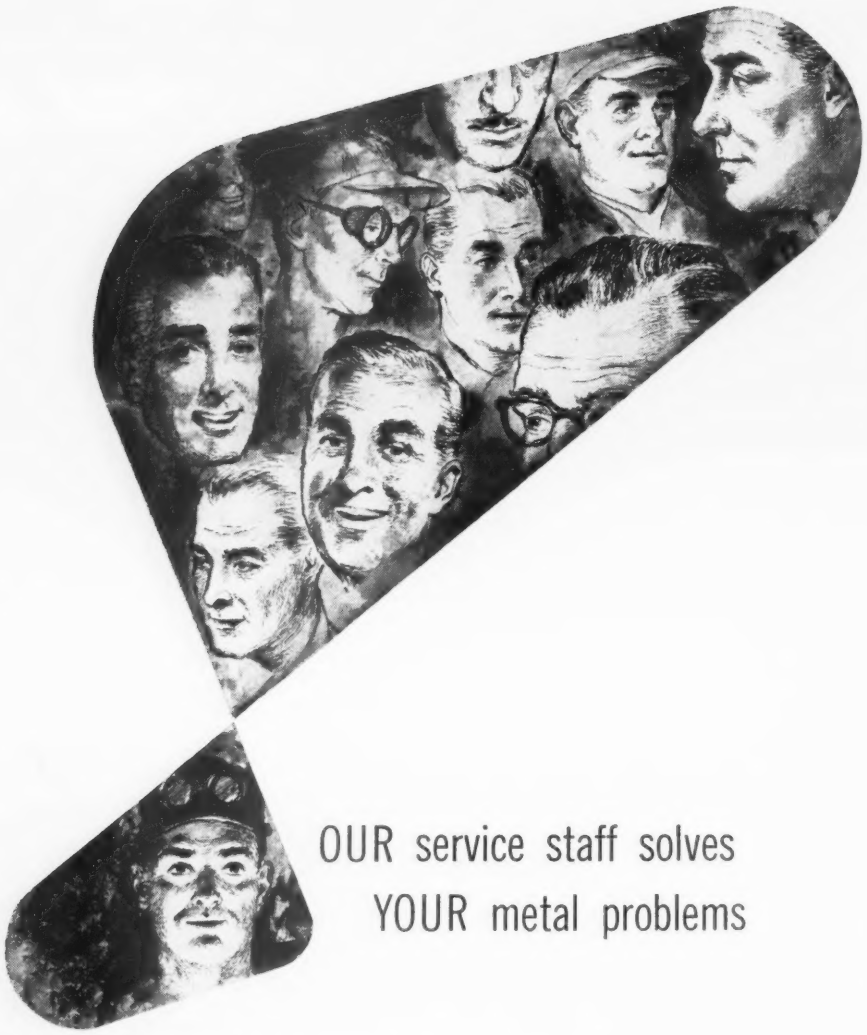

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ameter and length increased.

Bishop[50] in later tests found that this segregation was decreased either by making the cores thinner or from exothermic materials; and, also, as either the thickness of casting decreases or its area increases.

Another type of carbon segregation was noted in long tapered castings at some distance away from the riser in the form of V-shaped areas pointed toward the riser. This type of segregation resembles the shape of centerline shrinkage but is found when the amount of taper is intermediate between that causing shrinkage and that resulting in complete feeding. It can be eliminated by making the neck opening sufficiently large.

Solidification Studies—Brinson and Duma[51] using radiography studied the soundness of steel castings of uniform thickness (between ½ and 4 in.) that had solidified in sand molds. Microscopic shrinkage voids of V-shape oriented in the direction of hottest liquid metal were observed in many of these castings. By proper application of padding, this centerline shrinkage could be completely eliminated. For sections 12 in. high, the amount of taper, or padding, required varied inversely as the thickness, from 2.6-in. per ft for 1-in. thickness to 0.15-in. per ft for 4-in. thick sections. Secondary factors such as casting temperature, gas evolution, metal pressure, rate of solidification, riser dimensions, casting position, and metal composition, exerted minor or negligible effects on centerline shrinkage.

In a series of research studies made at the Naval Research Laboratory foundry by Bishop and others[7, 8, 9, 52], the soundness of large castings having parallel walls was studied by radiography and other tests. Tests made with several thermocouples immersed in the mold cavity were able to record the temperature differences existing at different points within these castings as they solidified.

The maximum distance[7] from the riser edge to the casting edge that was found to be free of shrinkage was $4\frac{1}{2}$ times the casting thickness in large, semicircular plates of $\frac{1}{2}$, 1, and 2-in. thickness. The thermocouple studies of larger castings indicated three gradient zones, due, first, to chilling effect of casting edge, second, due to the heating of the riser, and, third, a region of uniform temperature between the others.

In thermal studies[8] of the solidification of steel castings in sand molds, agreement was obtained with predictions of the freezing time based on electrical analogue studies.

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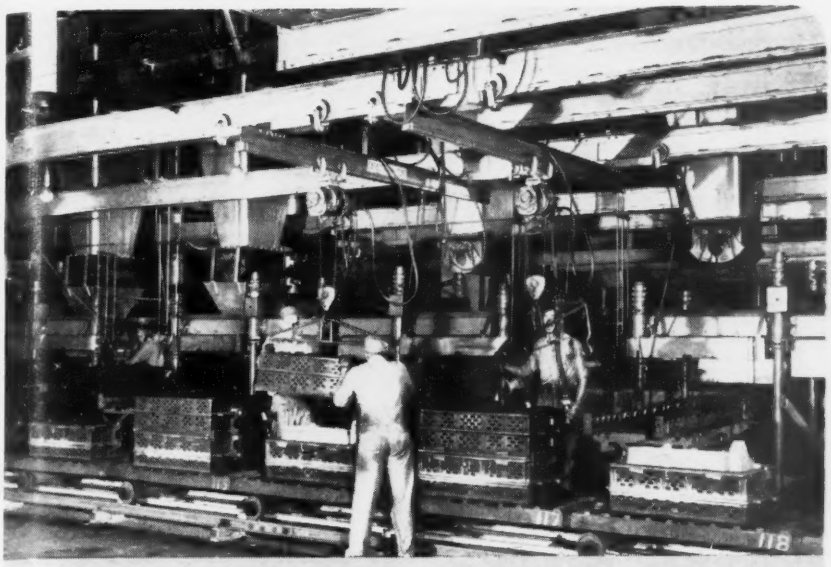

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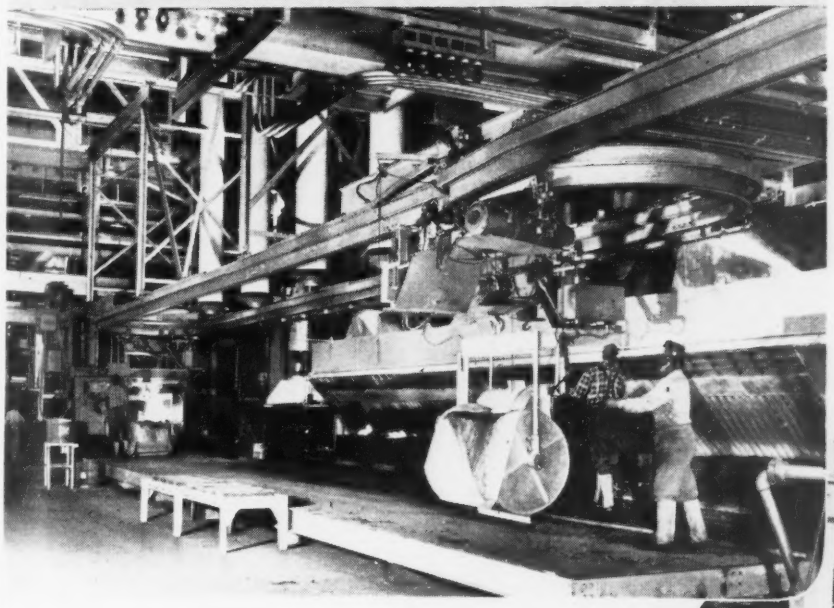
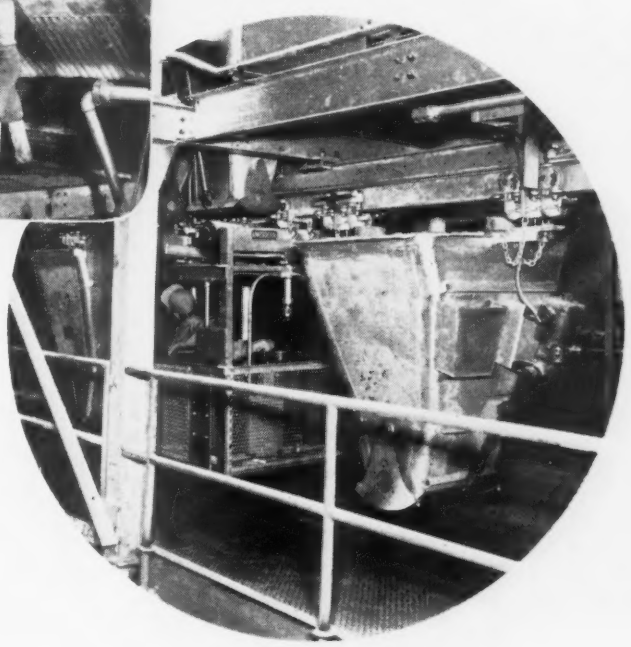


At the pouring loops, ladles on American MonoRail carriers move at the same rate as the flasks for quick, easy pouring. 41 carriers operate on 1250 feet of Shielded Rail Master Track to complete this operation.



American MonoRail equipment in the new Ford Cleveland Foundry moves core sand from hoppers to core blowers by means of 3 cab operated carriers on a Shielded Rail Master MonoRail System which includes 950 feet of track and 10 motor operated 2-way glide switches.

Other systems, as illustrated, handle flasks and ladles over extensive American MonoRail Installations.

Experienced engineers will be glad to consult with you on any handling problems in your foundry. Write for the new "Case Study File" showing other applications.

THE AMERICAN MONORAIL COMPANY

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(*Continued from page* 248)

The maximum distance[9] found in inches which could be made sound in cast rectangular steel bars in sand molds was found to follow an empirical rule of $D = 6\ T^{0.5}$ where T represents section thickness. The maximum measured lengths of sound bars in horizontal castings for 2 x 2, 4 x 4, 6 x 6, and 8 x 8-in. cross sections were 8, 12, 15, and 16 inches, respectively. Similar distances were noted in vertical cast bars in each case except that the 8 x 8-in. section would feed for 21 in.

Completely dense steel castings then can be produced in parallel-walled sections if a critical distance from casting edges to the riser is not exceeded. This distance is chiefly fixed by the thickness (or smallest dimension) of the casting but will vary somewhat also with the shape of the casting and with the carbon content. The riser should be large enough in size to feed the casting according to the formula proposed by Caine[32]; however, larger risers do not increase the critical feeding distance.

This critical distance found in the Naval Research Laboratory studies[7, 8, 9, 53] nearly is proportional to the square root of the section thickness.

Dense castings of greater length or area can be produced by padding, or tapering, the section to increase its thickness in the vicinity of the riser. Other useful methods are chilling the casting extremities or insulating near the risers. These methods promote the establishment of continuous temperature gradients along the centerline of the casting from extremities into risers.

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(*Concluded on page* 252)

100 YEARS: A total of 100 years of continuous service with Marion Malleable Iron Works, Marion, Ind., division of the Chicago Railway Equipment Co., is represented by the three brothers shown here. Twins Hubert and Huston Pate, left and right, are hard iron trimmers and have 31 and 34 years of service respectively. Frank Pate, in the center, is an annealing room packer and has 35 years of service with the firm

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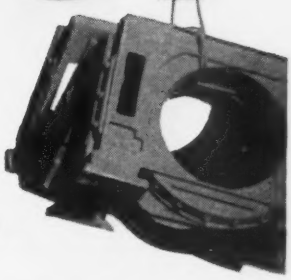

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Note: The name of any firm, product or process listed herein is not to be construed as a recommendation but merely as a typical reference. Commercial directories generally will supply additional sources of information.

Industries Set Record For Safety in 1952

Workers employed by member companies of the National Safety Council had the safest year on record in 1952. They had fewer on-the-job accidents, and those they had were less serious. Of the 40 basic industry classifications, 31 reduced their frequency rates and 25 reduced severity rates.

Average 1952 accident frequency rate for employees in all industries submitting company reports to the council, based on the number of disabling injuries per million man-hours, was 8.4, a reduction of 7 per cent from 1951. The average accident severity rate, based on the number of days lost per 1000 man-hours, was 0.88, a decrease of 9 per cent.

The foundry accident frequency rate was 13.93, a decrease of 14 per cent, and ranked the industry 28th out of the 40 reporting. The foundry severity rate of 1.05 represents a 19 per cent decrease and ranks the industry 30th out of the 40.

The council's rate is based principally on the experience of its members. In the case of foundries this represents only 135 reporting units. Actually, the accident rate in foundries was probably double that of the NSC figure. For 1951, the latest year for which figures are available, the U. S. Bureau of Labor Statistics reported an accident frequency rate among 1262 foundries of 33.2 and a severity rate of 2.2.

Safety Congress To Meet in Chicago Oct. 19-23

When the 41st National Safety Congress and Exposition meets in Chicago Oct. 19-23, at Conrad Hilton Hotel, the metals section program will offer many topics of interest to metal products men, such as safety in the foundry and safety in fabricating and warehousing.

The program for Monday morning, Oct. 19, includes seven 5-minute speakers, each representing a winning plant in one of the seven sections of the metals section contest, discussing "Our Best Safety Idea for 1953." P. J. Muntan, American Radiator & Standard Sanitary Corp., Louisville, will discuss foundry safety.

Thursday afternoon, Oct. 22, a program on safety in the foundry will be presented, including a talk by M. V. Gordon, engine and foundry division, Ford Motor Co., Dearborn, Mich., and a panel discussion by experts representing each branch of the foundry industry. The panel will answer questions submitted by the audience. Earle M. Layman, General Steel Castings Corp., Granite City, Ill., will direct the panel.

Further information regarding the congress and exhibition is available from the National Safety Council, 425 North Michigan Ave., Chicago 11.

"Too much overtime, Fred?"

Heads Public Relations

Alloy Casting Institute, New York has appointed Edward H. Platz Jr., Lebanon Steel Foundry, Lebanon, Pa., chairman of its public relations committee. Named to serve with him are Brad B. Evans, Empire Steel Castings Inc., Reading, Pa., and C. M. Ruprecht, Electro-Alloys Division, American Brake Shoe Co., Elyria, O.

Manufacturers of Foundry Equipment To Meet

The 35th annual meeting of the Foundry Equipment Manufacturers Association will be held at the Greenbrier, White Sulphur Springs, W. Va., Oct. 15-17. The affair will be highlighted by the presence of William J. Grede, president, Grede Foundries Inc., Milwaukee, and past president of the National Association of Manufacturers, who will present his observations from a recent trip through various countries in Europe.

Discussions will be held concerning such aspects of foundry equipment as molding, dust and fumes, flasks, blast cleaning and tumbling, furnaces and accessories, material handling and processing. A round-table discussion will be held on "The Outlook for Foundry Equipment" in an attempt to determine how the industry can be of the best possible service to its customers. A report also will be made on the International Foundry Congress in Paris, which was attended by the president and the vice president of the association.

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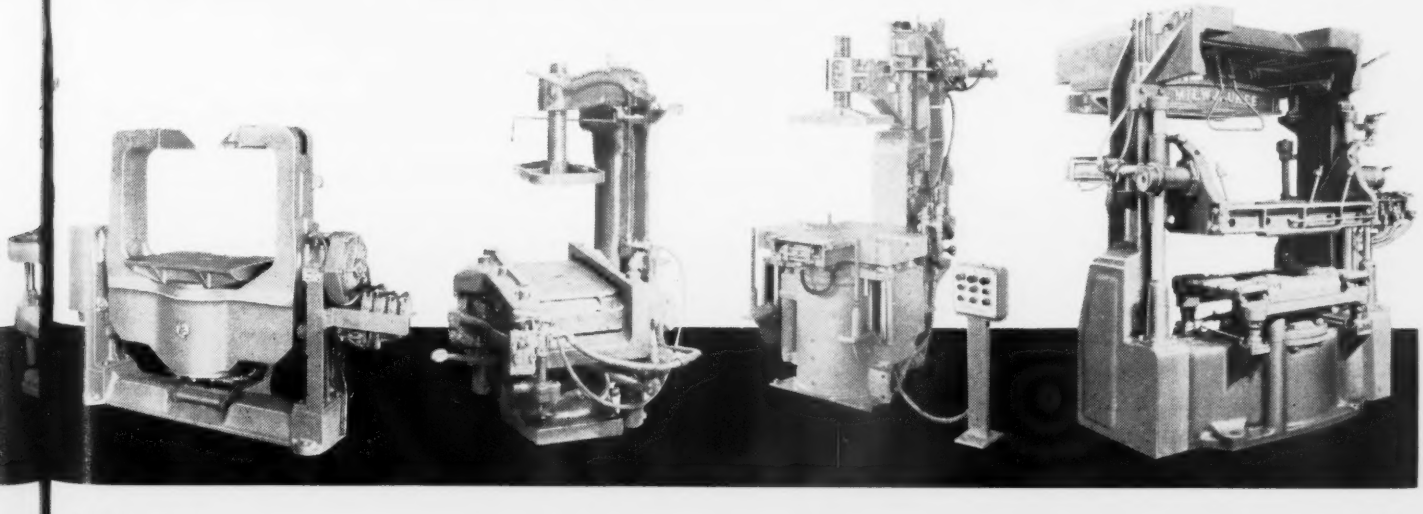

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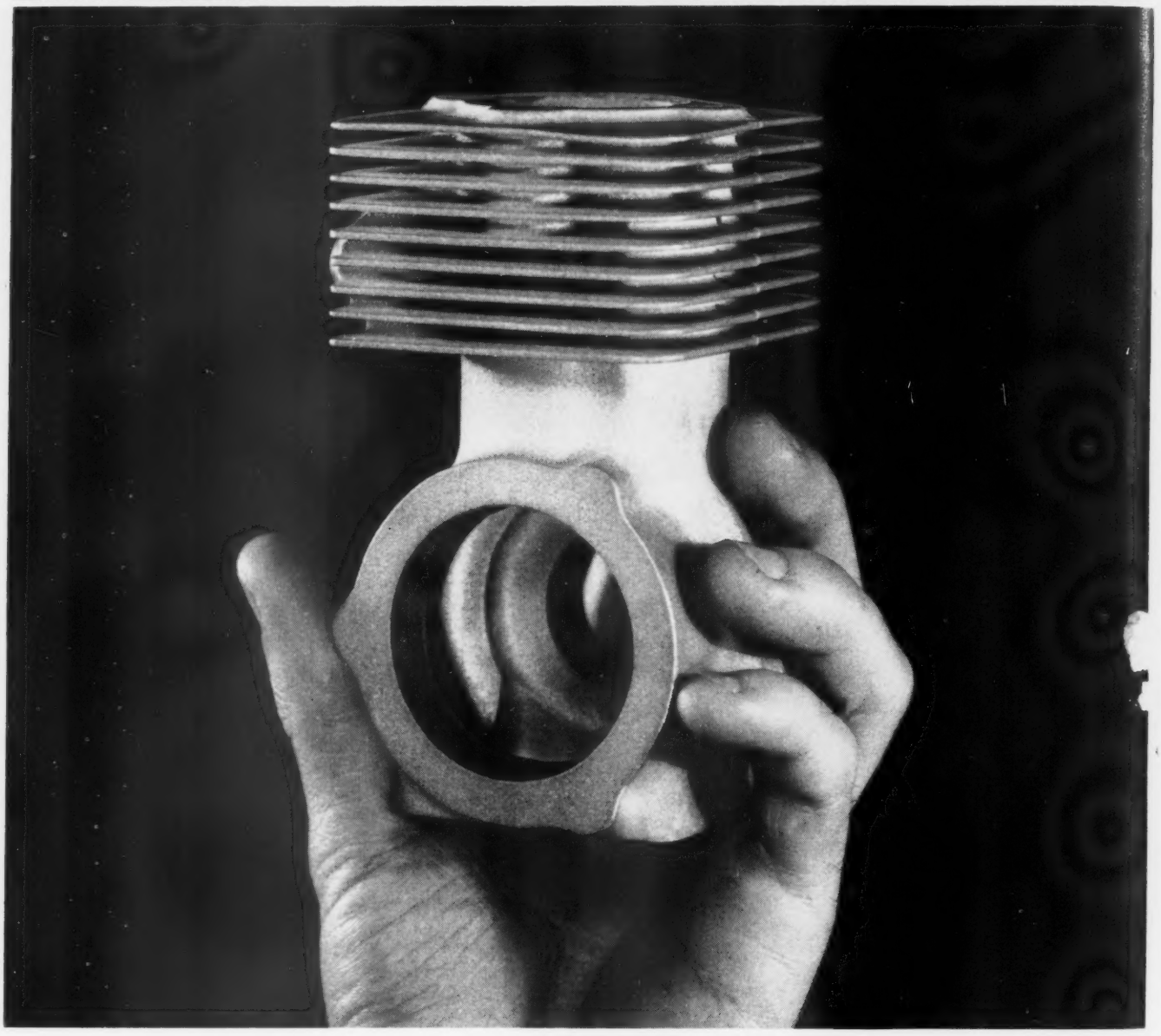

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It is virtually impossible to produce castings with these specifications in green sand molds. With shell molds, castings such as this become routine production items.

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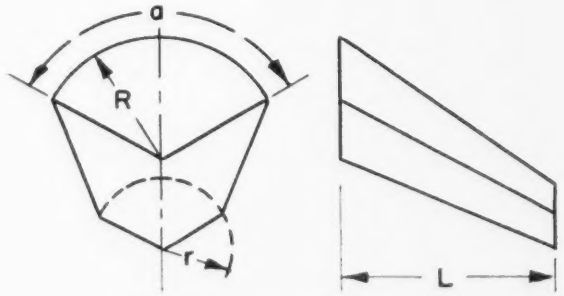
THE BORDEN COMPANY

Chemical Division

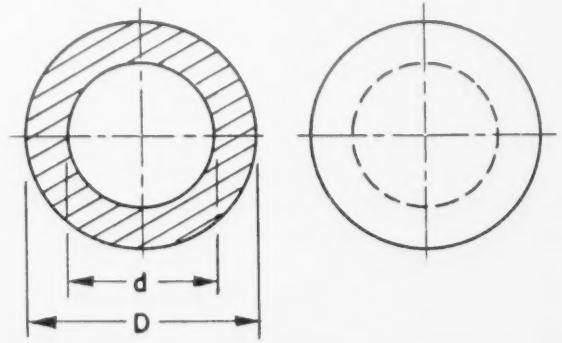
Formulas for Determining Weights of Castings

(Continued from September)



To find the weight of a sector of a frustrum of a cone, multiply the sum of the radius of the large base squared, the radius of the small base squared and the product of the radii by the length, by the number of degrees in the angle, by the value of C. (See Table VII) page 266, August issue.

$$W = (R^2 + r^2 + R\,r)\,L\,a\,C$$



To find the weight of a hollow sphere, multiply the difference between the cubes of the outside and inside diameters by the constant, M, corresponding to the weight per cubic inch. (Table VIII).

$$W = (D^3 - d^3)M$$

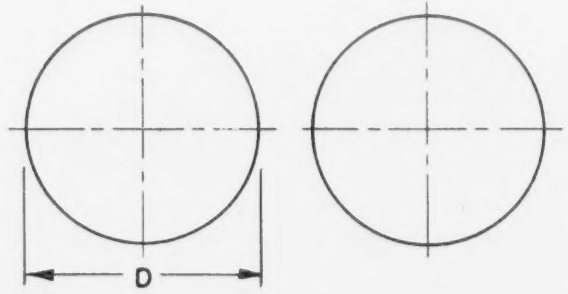
Table VIII

Wt. per cu in.	K	M	Wt. per cu. in.	K	M	Wt. per cu. in.	K	M	Wt. per cu. in.	K	M
.096	.048	.0503	.210	.105	.1100	.330	.165	.1728	.450	.225	.2356
.100	.050	.0524	.220	.110	.1152	.340	.170	.1780	.460	.230	.2408
.110	.055	.0576	.230	.115	.1204	.350	.175	.1832	.470	.235	.2460
.120	.060	.0628	.240	.120	.1257	.360	.180	.1885	.480	.240	.2513
.130	.065	.0680	.250	.125	.1309	.370	.185	.1937	.490	.245	.2565
.140	.070	.0732	.260	.130	.1361	.380	.190	.1989	.500	.250	.2617
.150	.075	.0785	.270	.135	.1414	.390	.195	.2042	.510	.255	.2670
.160	.080	.0838	.280	.140	.1466	.400	.200	.2094	.520	.260	.2722
.170	.085	.0891	.290	.145	.1518	.410	.205	.2146	.530	.265	.2774
.180	.090	.0943	.300	.150	.1571	.420	.210	.2199	.540	.270	.2827
.190	.095	.0995	.310	.155	.1623	.430	.215	.2251	.550	.275	.2879
.200	.100	.1047	.320	.160	.1675	.440	.220	.2303	.560	.280	.2931

Interpolation Table

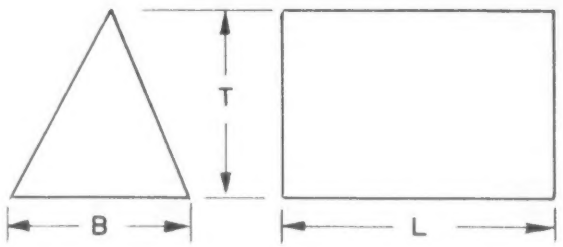
Ad'l wt.	Ad'l K	Ad'l M	Ad'l wt.	Ad'l K	Ad'l M	Ad'l wt.	Ad'l K	Ad'l M
.001	.0005	.0005	.004	.0020	.0021	.007	.0035	.0037
.002	.0010	.0010	.005	.0025	.0026	.008	.0040	.0042
.003	.0015	.0016	.006	.0030	.0031	.009	.0045	.0049

For method of interpolation, see Table II (July issue, page 150)



To find the weight of a solid sphere, multiply the diameter cubed by the the constant, M, coresponding to the weight per cubic inch. (Table VIII).

$$W = D^3M$$



To find the weight of a solid triangular casting, multiply the length by the width, by the thickness, by the constant, K, corresponding to the weight per cubic inch of material used. (See Table VIII).

$$W = LBTK$$

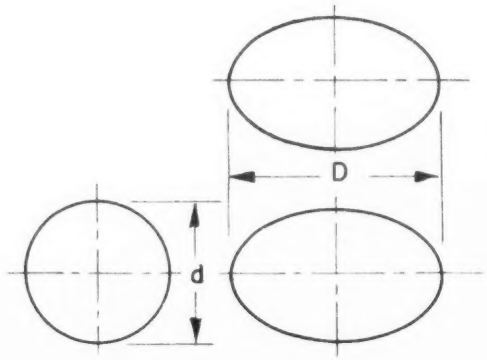
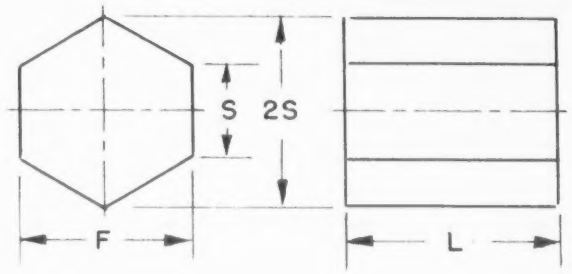


Fig. 28

To find the weight of an ellipsoid, multiply the square of the revolving axis by the fixed axis by the constant, M, corresponding to the weight per cubic inch. (See Table VIII).

$$W = Dd^2 \times M$$



To find the weight of a hexagonal casting, multiply the square of the side by the length, by the constant, K, corresponding to the weight per cubic inch, or multiply the square of the distance across the flats by the length by the value of M. (See Table IX).

$$W = S^2\ L\ K \text{ or } W = F^2\ L\ M$$

Table IX

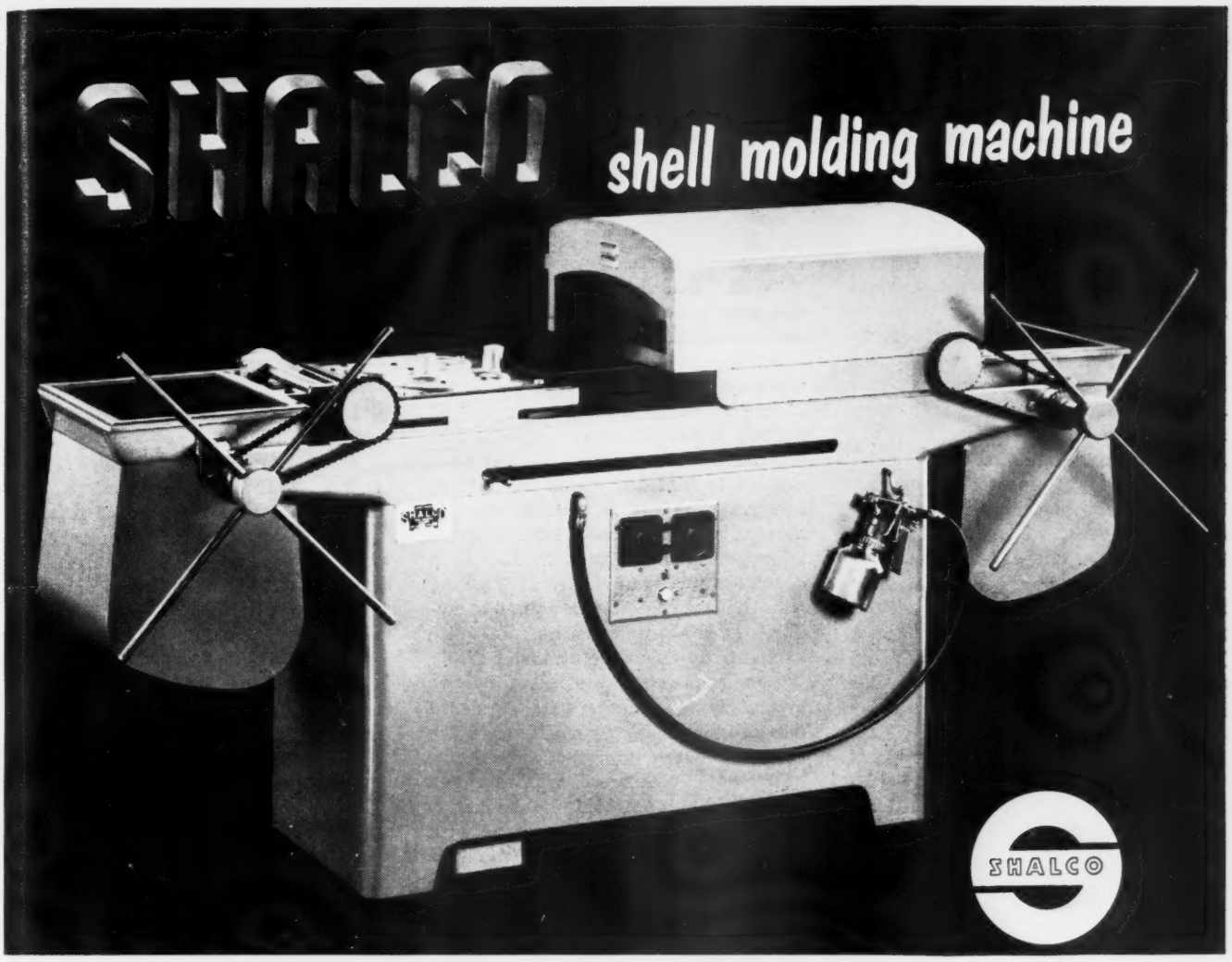
Wt. per cu. in.	K	M	C	Wt. per cu. in.	K	M	C	Wt. per cu. in.	K	M	C
.096	.2494	.0831	.0277	.250	.6495	.2165	.0722	.410	1.0652	.3551	.1184
.100	.2598	.0866	.0289	.260	.6755	.2252	.0751	.420	1.0912	.3637	.1212
.110	.2858	.0953	.0318	.270	.7015	.2338	.0779	.430	1.1172	.3724	.1241
.120	.3118	.1039	.0346	.280	.7275	.2425	.0808	.440	1.1432	.3811	.1270
.130	.3378	.1126	.0375	.290	.7534	.2512	.0837	.450	1.1691	.3897	.1299
.140	.3637	.1212	.0404	.300	.7794	.2598	.0866	.460	1.1951	.3984	.1328
.150	.3897	.1299	.0433	.310	.8054	.2685	.0895	.470	1.2211	.4070	.1357
.160	.4157	.1386	.0462	.320	.8314	.2771	.0924	.480	1.2471	.4157	.1386
.170	.4417	.1472	.0491	.330	.8574	.2858	.0953	.490	1.2731	.4244	.1415
.180	.4677	.1550	.0520	.340	.8833	.2944	.0981	.500	1.2990	.4330	.1443
.190	.4936	.1645	.0548	.350	.9093	.3031	.1010	.510	1.3250	.4417	.1472
.200	.5196	.1732	.0577	.360	.9353	.3118	.1039	.520	1.3510	.4503	.1501
.210	.5456	.1319	.0606	.370	.9613	.3204	.1068	.530	1.3770	.4590	.1530
.220	.5716	.1905	.0635	.330	.9873	.3291	.1097	.540	1.4030	.4677	.1559
.230	.5976	.1992	.0664	.390	1.0133	.3378	.1126	.550	1.4289	.4763	.1588
.240	.6235	.2079	.0693	.400	1.0392	.3464	.1155	.560	1.4549	.4850	.1617

Interpolation Table

Ad'l wt	Ad'l K	Ad'l M	Ad'l C	Ad'l wt.	Ad'l K	Ad'l M	Ad'l C	Ad'l wt.	Ad'l K	Ad'l M	Ad'l C
.001	.0026	.0009	.0003	.004	.0104	.0035	.0012	.007	.0181	.0060	.0020
.002	.0052	.0017	.0006	.005	.0130	.0043	.0014	.008	.0207	.0069	.0023
.003	.0078	.0026	.0009	.006	.0155	.0052	.0017	.009	.0233	.0078	.0026

For method of interpolation, see Table II (July issue, page 150).

(To Be Continued)



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Adventures of Bill

By PAT DWYER

Illustration by RICHEY

SOME time ago," Bill said, "you were complaining that foundrymen were pretty well down on the totem pole as letter writers. In a general way I gathered that this opinion was based on the frequency rate and not on the content. When the spirit moves one of these birds he can write a highly interesting epistle. Unfortunately, as you very sapiently observed, the spirit does not move him very often. Perhaps it would be more charitable to say the spirit may be willing but is not strong enough to overcome the inertia of the flesh. You probably remember the old foreign schoolboy translation: 'The ghost is willing but the meat is tired.'"

"And what, may I inquire, prompted this flow of oratory spiced with more or less doubtful quotations. Have you received a letter recently, or are you leading up to a plan or an excuse for not writing a letter that should have been written months, or more than likely, many long years ago?"

"Well," Bill said, "I'll tell you. At the recent convention in Chicago I ran into an old pal and we had quite a session reminiscing over the past, discussing the present and discreetly taking a peep or two into the future. Among other items of information, he told me of a job which had been offered to him but which he had not accepted. Instead of taking the job himself he had recommended a promising young man whom he had been coaching for some time. The young man had accepted the job, but apparently the promotion did not quite measure up to expectations.

"Our seance was broken up by two low noisy individuals who claimed I had promised to go with them to see a lady about a dog. Well, you know how it is. Before I was dragged away my old pal told me he had a letter at home from his protege with the whole tale of woe. He would be pleased to mail it to me after he arrived at the old home port and had cast anchor. That was last May. Apparently he had some trouble with the anchor chains or the winches. (Note to printer: The last word is spelled with an i)

"The document arrived only today with a brief explanatory note which did not explain the cause of the delay. Listen:

'Dear Bill: Here's the dope I was telling you about, one day at the convention. You might pass it along to Pat for his collection of rare—or should I say raw—foundry literature. Ha, Ha!' P. S. We did not buy the dog.'

"Here," Bill said. "Take a look at it."

Dear Archie: Many munes have come and gone and planeths have traversed their various orbits since the mighty San god has showed his favor on the two of us togeather.

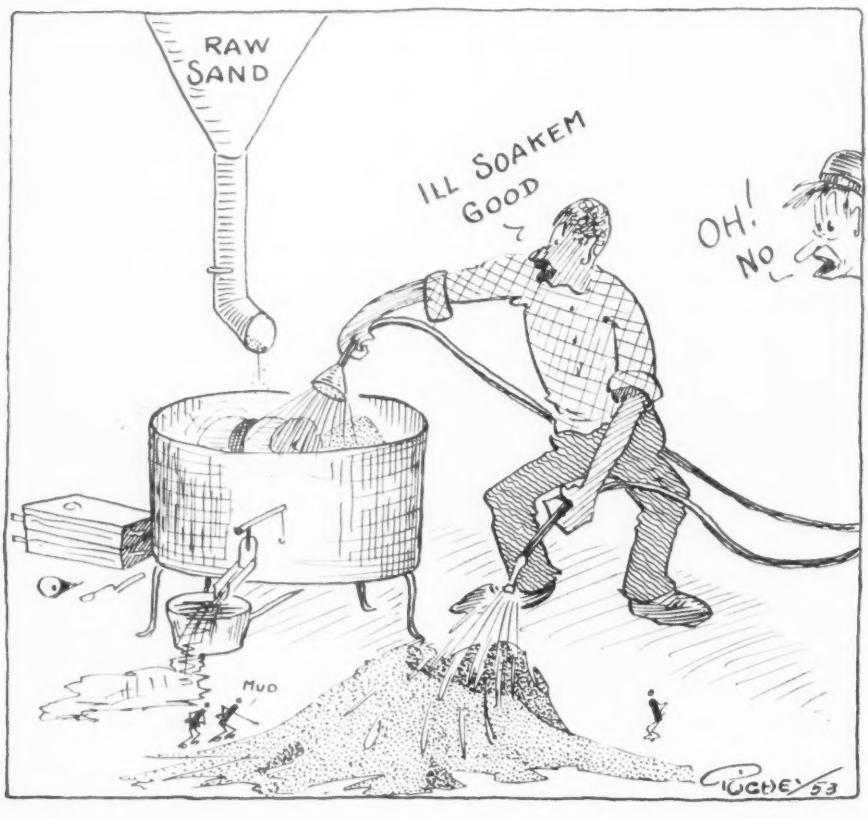
The mighty molder, true and faultless, has found generious hunting in the chosen land of the West. The birds are singing and the mound is filled to capacity, but this here last year, one of countless years of tried and true experience blooms fourth to soothe the needy and weak. (Wonder what he means? Ed) How has it been with you O Grand Master?

I have run into a few problems which I shall atempt to list for you in the next ten pages, but on the hole nothing is correct.

Take for example the melting room. The six crucible type melting furnaces have cracked, split and crumbling linings. The melter hasent the slightest idea of how to melt, reline or take care of his equipment. We are using No. 80 crucibles and getting about 40 heats to a pot. The air and fuel controles are so worn that it takes a magishian to operate them. The furnaces are oil fired, but how, nobody seems to know. There is no analisis of the pig and the scrap *was* being charged back as dirty as possible.

The wiring in this dipartment is so old and coroded that it cannot be handled at all. The pyromiters, of which we have 4, are not known to be accurate in as much as they never had been used until I came. Some atempt is made to flux the metal by the adition of a random chunck of zinck added to each heat before skimming.

(*Continued on page* 260)



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A Stearns power-packed lifting magnet provides a tremendous pulling force that reaches well into the body of the load it is lifting. That's why it safely hoists and swings heavy loads even though only a small surface touches the lifting magnet. This is a big advantage for quickly moving bulky units out of cramped quarters. With a Stearns magnet you eliminate straps, slings and other devices — save hours of material handling time.

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- ✓ *Waterproof construction*
- ✓ *Fast heat dissipation*
- ✓ *Rugged, all-welded or bolted construction*

Here a Stearns magnet lifts an 8,000-lb. casting. Note small point of contact — a real test of deep-down pulling power.

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

1051

STEARNS MAGNETIC, INC. **662 S. 28th St., Milwaukee 46, Wis.**

(*Continued from page* 258)

The core room is equaly well equiped both in personell & equipment. It seems that the core oil used is of an undetermined origin and composition, added to which we have approx. 55 galons of it on hand. The core mix is mulled in a dirty muller which has never been clened since it came here god knows how long ago, by the most accurate method obtanable, mainly by the shovle or bucketful, depending on which is the handiest to reach.

The core oven is of the mounster type, meaning that it completely consumes every one and every thing approaching it. The controles for this monster are assumed to be as acurate as the pyromiters previously mentioned. Baking time is regulated directly upon the disposition of this iron clad dragon which during some cycles completely consumes the heaviest of cores and upon other perioudes of operations woldent melt butter. However all is not lost. It seem that particularly good coffiee can be obtained prior to 9: o-clock each morning and 12: o-clock each dinner time by placing a well aged purckuolator in the oven with the cores, retrieving same before the pot is melted. Therefore it can safely be said that we have one of the states larges and most expensive coffiee makers at our plant.

One thing can be said in all fairness for this dipartment, the core makers regaurdless of their knowledge of core mixes can produce clean acurate cores with thier equipment and I believe on the basis of this they should be given life membership in the Ten Lost Tribes of Foundrymens Club, or if this is not possible, at least they should be given life in some form.

Now we approach the molding dipartment from the west, as far west as possible would be your best bet in as much as this dipartment is realy screwed up. The molding sand is known to be 'Love-In-Bloom.' Beyond this nothing is known, even the analisis of the loveinbloom is not known due to the fact that no information of any kind was supplied with the shipment. Do you happen to know if Jack Benny is in the sand business?

The sand now being used on the floor is black, not blue or green or any other color. This caused I am told by the fact that the sand has never been changed at any time. The only reason new sand is added sparingly is because a lot of sand is carried away imbeded permanently in the castings. That is in the space not already ocupide by gas, blows, voids or cores. Therefore at this rate one truck load of sand will last indefinately.

We have half a dozen squiese jolt machines, 5 of which only jolt and do not squiese. This condition exists due to the following reasons. (1) The machines are burried under so much floor sand that the squeze levers cannot be seen let alone reached. (2) The adjusting top normaly found on the back of these machines does not operate. (3) The machines are full of water instead of oil because no one had ever heard of the bleedof on the bottom of the machine. (4) The machines are so far out of repair that if they should misfire and squize either one or two sides of the mold will be higher than the other sides.

The molders in general know how to mold, that is they know some of the basic facts such as which is top and which is bottom sometimes known as cope and drag, but not here. We have one expert floor and bench molder. He has had an exceptionaly long tenure of service at molding, something like 4 or 5 months I believe they told me. The machine

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molders with the exception of one have had more experience. In accordance with every thing else this figures out about right.

All floor sand is conditioned through an overhead vibrating riddle. The screens in the riddle are very fine mesch ranging in size from holes as big as a dime to biger than your head. The sand is returned to each heap while it is still hot and watered down with acurate equipment ranging from garden hose to garden hose with showerhead attachments. The moisture is gaged from bone dry to mud wet by a very compitent chockliate collored fella about 20 years old who had completed the fourth grade when he left school. In addition to wetting down the sand he is kept busy sweeping the floors and shifting weights on the snap flast molds.

This brings us to the molding tools which range from scoop shoveles stamped out flat to sprue cutters of sizes no smaller than a silver dollar. I made a brash and dairing move and introduced such rare items as vent wires, new slicks and soft brushes which I found well stored in various out of the way places covered with more dust than you get going through a cement plant. In general the mill room, inspection personnel and various other dipartments are in the same condition as the foregoing dipartments. I dident intend to write a book when I started, but I know you would get a bang out of knowing what you missed.

I can honestly say that every man in the place knows he doesent know and is very willing to try any thingg he is told. It has been possible in the last three days to show a marked improvement in the castings by the reduction of gas in the castings and by reducing sand wash through bringing the mold hardness from 10-30 to 70-80. As other controles can be obtained better castings can be procured.

As you can see I have a hell of a job on my hands, but I do have a wonderful assistant that knows a great many basic foundry practices. Through him I get a lot of work done that would normally take me the greater part of my time to do. The situation is far from being out of controle so far as I am concerned and I have no doubts that in a short time I can make this the best brass shop in town.

You might give me a few hints about how to bring up the molding sand green strength for this work that will not produce stickers on long draws and excessive gas. I have a new plate 12 x 16 with a long draw that will not stand up. New sand is possible and will be put in

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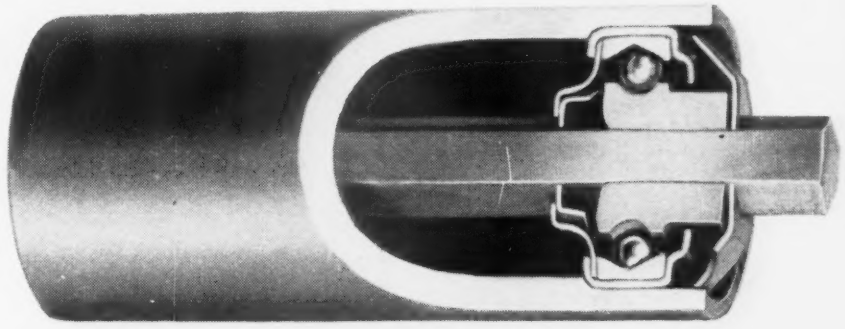

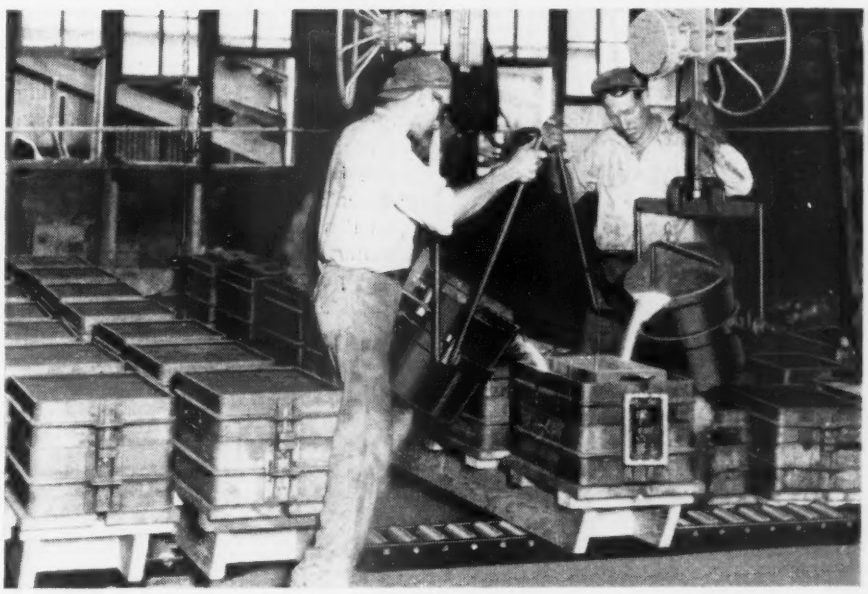

Every Standard roller conveyor is equipped with specially designed bearings that provide the maximum of protection and durability in foundry service. Spillage of hot iron is guarded against by special steel shields. These convex shaped shields fit into the ends of rollers to repel foreign matter. An exit for small particles is provided by an opening at bottom of shield.

Foundry conveyors are designed and built in their entirety by Standard—in a wide range of sizes, weights and types. You can depend on Standard for the right conveyor for your needs — we have been designing and building foundry conveyors since 1906.

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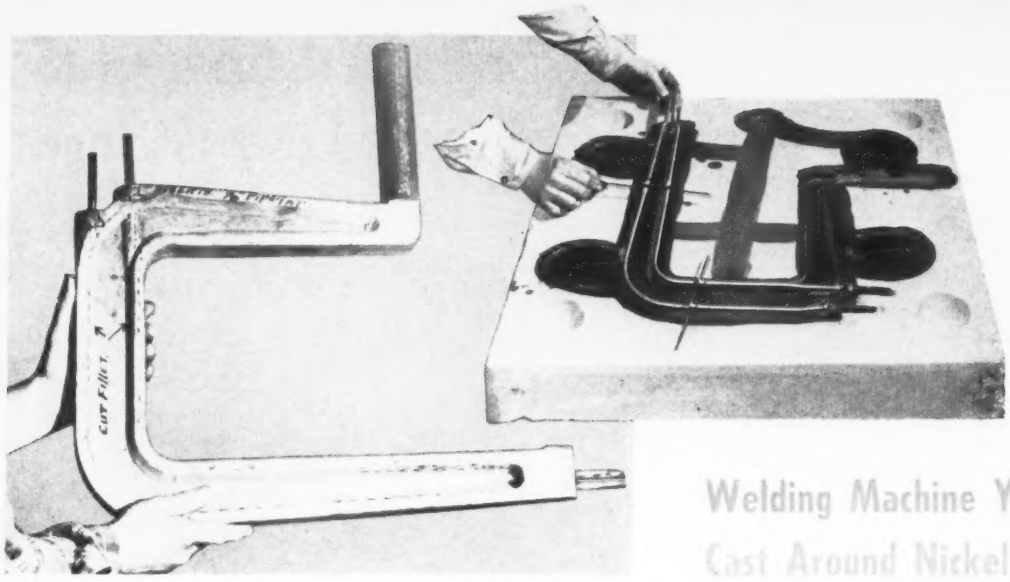


Fig. 1 (right) — Monel chaplets hold tubing in place in the mold

Fig. 2 (left) — Pattern for a spot-welder yoke

Welding Machine Yoke Is Cast Around Nickel Tubing

ELECTRODE tips for spot-welding machines are subjected to intense heat and can burn up at a rapid rate unless cooled by a steady flow of water. To meet this requirement a cooling element is incorporated in the spot-welding arm or yoke shown in the accompanying illustrations. It consists of ⅜-in. OD nickel tubing made by Superior Tube Co., Norristown, Pa.

The yoke shown is one of the many types made by Philadelphia Bronze & Brass Corp., Philadelphia. Two lengths of nickel tubing, ⅜-in. OD x ¼-in. ID, convey water to and from the end of the spot-welding yoke on which the electrode is placed.

Body of the yoke is a copper-chromium alloy which is poured at 2200° F. Naturally the tubing around which the alloy is cast must successfully withstand this pouring temperature and must not dissolve in the molten metal. Of equal importance, the tubing material must not be affected by water passing through it as it would be difficult and time-consuming to remove any rust or corrosion products which might form.

Philadelphia Bronze & Brass cold-bends the tubing by hand to the desired shape. For that reason tubing of good ductility was considered highly desirable. To meet the requirements of the application, specifications call for either nickel or Inconel tubing inside the welder yoke. Both materials are nonrusting and are unaffected by the copper-chromium alloy at pouring temperature.

Fully annealed nickel tubing is bent easily by hand even though the wall thickness is 0.065-in. After the tubing is bent to shape, Monel chaplets are welded to both lengths of tubing to hold them in position in the mold as shown in an accompanying illustration. Tube ends are cut off flush on the finished casting.

Philadelphia Bronze casts about 150 nonferrous alloys to customers' specifications. Many of the orders call for tubing inserts, and the foundry maintains stocks of nickel, Monel, Inconel and AISI type 4130 steel tubing for such jobs. No difficulty in casting around tubing has been experienced, providing correct analysis and wall thickness of tubing is specified, and good foundry practice is followed. It is only necessary to keep close control of pouring temperature of the alloy to prevent burning through the tubing when it is poured into the mold.

Saturday if I can get some help. In order to put it in it must be done by hand with a shovele & a wheel barro and I am not man enuff to do it all by myself for all the bays.

Say hello to the family for me and let me hear from you soon. I have gone on and gon on about me so lets hear from you soon. It might be wise to write me at the foundry (See address above) and mark envolope "Personal" and my name, that way I am sure to get it.

I havent found a place to live yet but will soon I am sure. Send the fore part of this letter to Pat Dewire for a new addition of his "Tails of the Gangway."

Your grateful Dissiple
John C. (C for Chosef) Hunter

"I wouldn't like to say a word against your old pal," I said, "in view of the well known reputation enjoyed by all true foundrymen for modesty, brevity and accuracy in either oral or written statement. The fact that he turned the job down would seem to indicate that he was fully aware of conditions in the plant. He realized he was no modern Hercules faced with the job of cleaning out the Augean stables. Apparently also he had full confidence in his protege. Converting a rathole of a foundry into the best brass shop in town would be only child's play for a man who could write a letter like Chosef."

Book Review

Textbook of the Materials of Engineering, 8th edition, by Herbert F. Moore and Mark B. Moore, cloth, 372 pages, 6 x 9 in., published by McGraw-Hill Book Co., New York. Price $6.

This is the eighth edition of a textbook designed to furnish a concise, elementary presentation of the physical properties of the common materials used in structures and machines, together with brief descriptions of their manufacture and fabrication. Some material has been added, and other material has been revised. The lists of references for further study have been enlarged.

Forms New Division

Stephens-Adamson Mfg. Co., Aurora, Ill., has formed a new division, the S-A Standard Products Division. The new department was organized to handle the company's line of centrifugal loaders, car pullers, bin level controls, hoists and winches, speed reducers, conveyor belt cleaners, holdbacks and carriers.

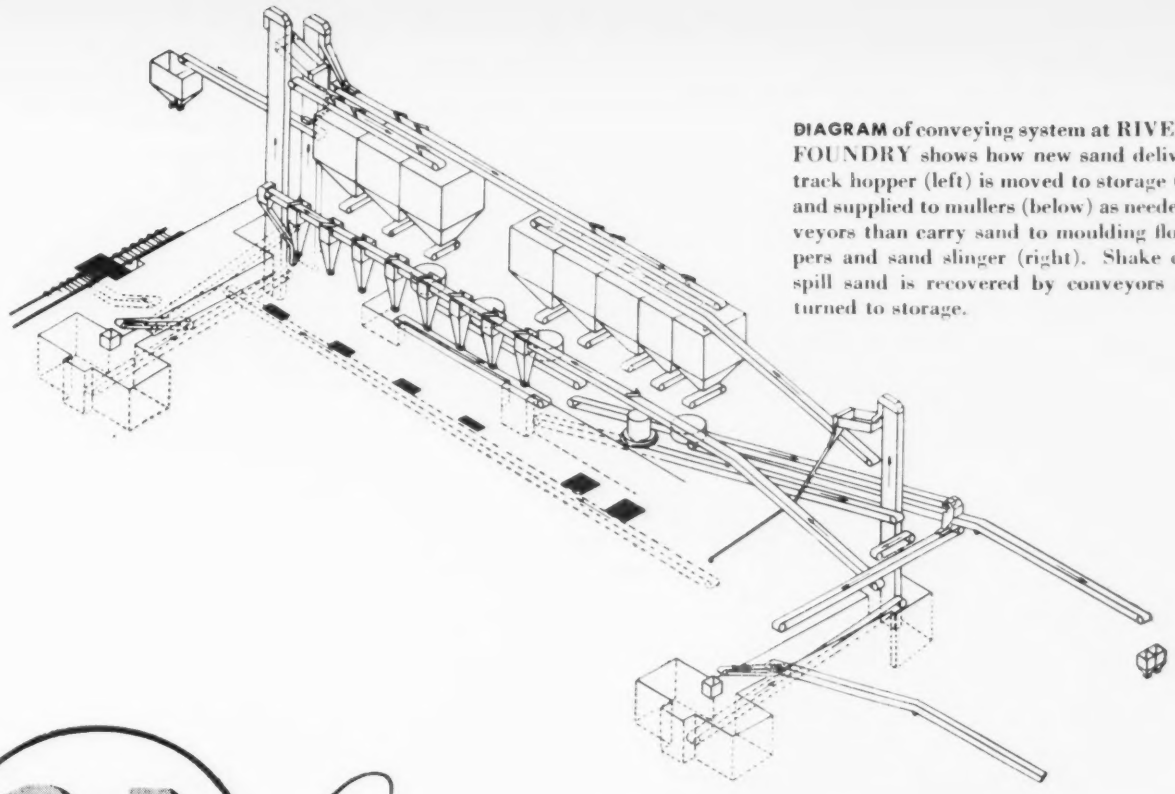


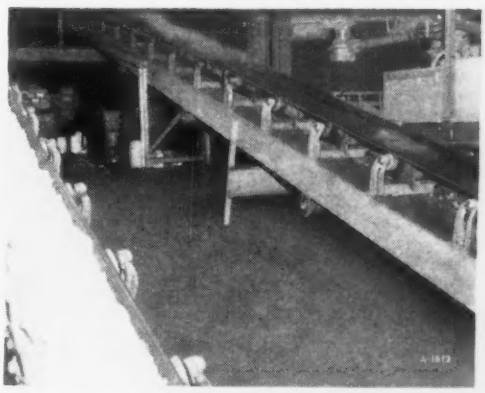
DIAGRAM of conveying system at RIVERSIDE FOUNDRY shows how new sand delivered at track hopper (left) is moved to storage (center) and supplied to mullers (below) as needed. Conveyors than carry sand to moulding floor hoppers and sand slinger (right). Shake out and spill sand is recovered by conveyors and returned to storage.

S-A CONVEYING System

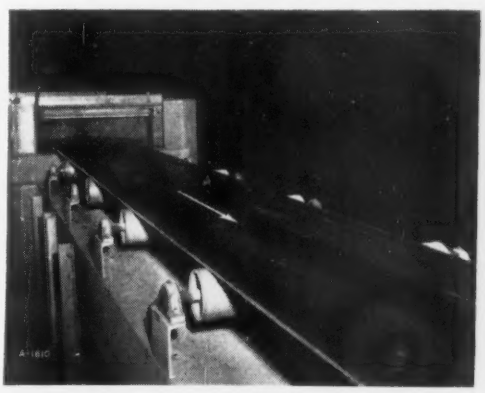
Eliminates All Manual Handling of **CORE** and **MOLDING SAND**

Faster production of armor was the problem—a complete sand handling system was the answer at the Riverside Foundry, Incorporated, Bettendorf, Iowa. Now, new and reclaimed molding sand is stored, moved to molds and recovered—entirely by conveyors and elevators. Core sand, binders and other components are elevated to storage by Redler conveyor-elevators in another part of the system. This entire job was installed without interrupting production on the foundry floor.

Whether your operation is large or small, find out what modernizing your foundry with an S-A sand handling system can save in time and money for you—ask an S-A engineer to survey your sand handling methods. There's a good chance he can show you ways to step up production and cut operating costs. You can be sure of an accurate, authoritative report from a man who is backed by S-A's more than fifty years experience in materials handling. And, with S-A's complete line to select from, he can give unbiased advice about equipment that will best meet your needs. Write for this free survey today.



● Core sand moves to storage on belt at left. Conveyor at right carries sand from shake-out pit for return to storage.



● Above storage bins, V-plows discharge the belts into the desired bin.

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DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

Heat Treatment of Steel

(*Continued from page* 125)

heavy forged or rolled pieces, were it not that, in the process of forging or rolling, the microshrinkages weld up, just as do the deep-seated blowholes purposely created in ingots of rimming steel used for the manufacture of plate.

Fig. 9 shows a deep-etched section of a portion of a heavy steel casting in which pronounced dendritic segregation was evident. The small black dots in the illustration are microshrinkages, and it will be noted that in the heavier part of the piece, many of them are located in lines parallel to the original dendrites. Tests cut from the heavier portion of this casting after a normalizing heat treatment showed the mechanical properties indicated in Table I. Composition of this casting is given in Table II. As far as the author is aware, there are no references in the literature to the influence of these microshrinkages upon the mechanical properties of heavy sections of cast steel, but there can be little if any doubt of either their presence or their harmful effect.

The dimensions of the austenite crystals formed as the steel cools through the temperature zone between the lines *AE* and *GOS* appear to vary in direct proportion with the size of the original dendrite structure. This in turn depends upon the pouring temperature and the rate of solidification, large dendrites being produced by high pouring temperatures and slow freezing. It is apparently true also that slow cooling through the temperature range between *AE* and *GOS* produces coarse austenite crystals. From this it follows that, at least up to a certain point, the larger the casting the coarser its austenite structure in the as-cast condition.

TABLE I

Character Of Test	T.S.	Y.P.	Ext. % 2"	R.A. %
Solid	62000	31000	24.5	53.3
Microshrink in fracture	65000	41000	7.5	22.4

The composition of this casting is given in Table II.

TABLE II

C	Mn	Si	P	S	Mo	Cr
0.17	0.74	0.10	0.012	0.020	Tr.	0.10

When hypoeutectoid steels cool to the temperature represented by the line *GOS*, ferrite begins to separate from the austenite solid solution and to crystallize in one of three forms a network surrounding the austenite grains, plates in their octahedral cleavages, or masses of considerable area. The amount of ferrite thus produced depends directly upon the carbon content, being 100 per cent in carbonless iron and zero in steels containing 0.80 per cent C. In metal of intermediate content, as for instance 0.40 per cent, the carbon of the remanent austenite from which the ferrite is separating, increases regularly, following the line *GOS*, until it reaches 0.80 per cent at the point *S*. The remaining austenite then transforms to pearlite.

In steels containing 0.80 per cent C, there is no change in the austenite until the temperature has fallen to that of the point *S*, when the entire mass of metal transforms to pearlite, whose grain size is the same as that of the austenite from which it forms. As hypereutectoid steels cool, free cementite separates out at temperatures represented by the line *ES*, the composition of the remanent "mother" austenite following the line *ES* until at the point *S* it contains 0.80 per cent C, when it transforms to pearlite. Upon cooling below the temperature represented by the line *PSK*, there is no further change in structure in any carbon steel.

As mentioned previously, the ter-

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You'll find two important reasons why Transite* Core Plates mean faster production: First, core makers can handle more plates with fewer trips. Second, Transite Core Plates are easier to clean . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

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They give long service—Made of tough, fibrous asbestos and cement, Transite Core Plates resist shock and corrosion—will not crack or break easily—require little, if any servicing. *Performance records of 8, 10 and 12 years are not unusual.*

They maintain accuracy — Transite Core Plates stay smooth through long, hard service. Foundrymen who have used them for years report minimum warpage.

For cores of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details write Johns-Manville, Box 60, New York 16, N. Y.

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Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

rite in hypoeutectoid steels may separate in masses of considerable area, known as "blocky" ferrite, as a network surrounding grains of pearlite, or as plate in the octahedral cleavages of the pearlite crystals. Frequently both network and cleavage plane types are found in the same casting. The rate of cooling through the "transformation range" (also known as the "critical temperature range"), between *GS* and *PS* governs the type of distribution of the ferrite; very slow cooling producing coarse blocky ferrite, an intermediate rate giving rise to network distribution, and a still faster rate resulting in the cleavage-plane arrangement. The latter is known as a "Widmanstaetten" structure (named after its discoverer), and in untreated cast steel is often associated with a large austenite crystal size. Figs. 2 and 5 are examples of the network type, and Fig. 6 illustrates the combination of Widmanstaetten and net-work ferrite distribution so often found in the same piece.

The network appearance is more readily recognized in steels containing 0.40 per cent C or over, such as is shown in Fig. 5, because there is so little ferrite present that it occupies only a small part of the surface. With lower carbon and more ferrite, the network, though present, is less clearly marked.

In some instances the ferrite network, instead of being roughly equiaxed, is elongated and appears to follow a pattern resembling that of primary dendrites. Fig. 7 is a typical example of this type of structure. Many years ago, in his book, *The Steel Foundry*,[3] the author called attention to the existence of this type of structure, and advanced a tentative theory to account for its formation. Now we know that it occurs because the rate of separation of ferrite from austenite is slowed down in the interdendritic areas by the concentration of phosphorus and remanent alloys there. The ferrite, therefore, forms first along the lines of the original dendrites. As cooling proceeds, these ferrite nets grow progressively wider and the interdendritic spaces become steadily higher in carbon until they transform to pearlite when their temperature and composition correspond to that of the point *S*. Although the actual dendrites no longer exist, therefore, the inhomegeneity of composition caused by them gives rise to a distribution of the ferrite and pearlite following their original outlines.

(*To be continued next month*)

REFERENCES

1. "Gates and Heads for Steel Castings" by John Howe Hall, FOUNDRY, March, 1952, page 115.
2. *Metallurgy of Steel Castings* by C. W. Briggs, page 515. Also Steel Founders' Society of America Research Reports 15 and 19.
3. *The Steel Foundry* by John Howe Hall, page 207.

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300-320 MOORE ST. HARRISON, OHIO

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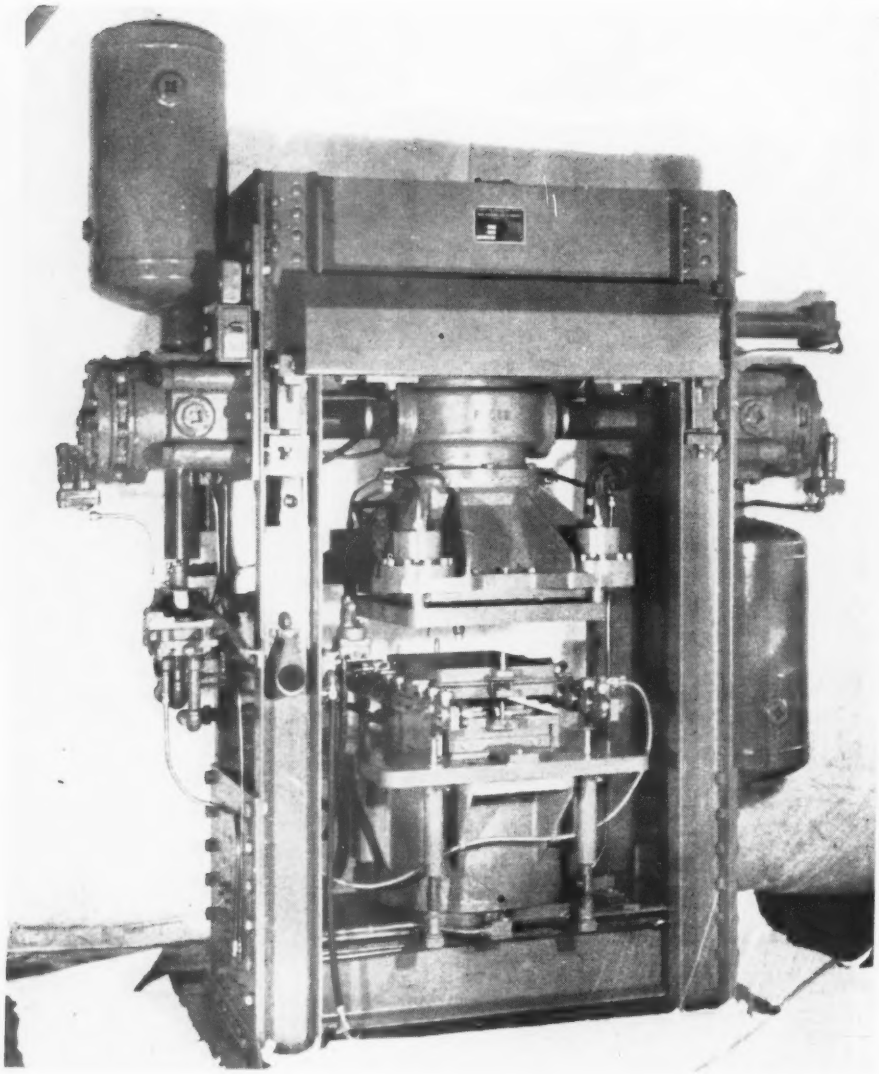


Mold Blower: Wm. Demmler & Bros., Kewanee, Ill.—The blowing principle which long has been used in producing sand cores has been adapted to the high-speed making of molds in this new machine. In addition to ramming the sand through its introduction into the flask by blowing, the unit also incorporates a quick squeezing action that completes the mold. The machine is available in capacities to accommodate flasks of various sizes. Shown here is a unit designed to make stack molds in flasks 12 x 20 x 3 in. Only one operator is required to run the machine. In this particular application the operator also sets four cores and is said to attain a production of 1000 molds in an eight-hour day. Elapsed time for the actual molding cycle alone is slightly more than eight seconds. When the blower is employed in making the usual two-part mold, one machine turns out the cope and a second one the drag.

For More Details Circle No. 1—Page 269

Core Cement: Fairmont Chemical Co., South Center St., East Syracuse, N. Y.—New, fast-drying, lacquer type adhesive for joining together baked sand cores is said to dry thoroughly in a few minutes and provide a joint stronger than the core itself. Known as Core Cement No. 125, it is used much like ordinary household cement that is dispensed from a tube. In practice, the cement is placed in the type of paste bulb commonly used in corerooms and squeezed out liberally on the core joint.

For More Details Circle No. 2—Page 269

Aluminum Welding Rod: All-State Welding Alloys Co., 249-55 Ferris Ave., White Plains, N. Y.—Cast aluminum welding rod for torch work in assembling, repairing and reclaiming sand castings of aluminum is intended basically for welding under such specifications as ASTM B26-50T. It meets government specification QQ-R-566, Type I, Class FS-RAL-355. It is said to have a plastic range of from 1025 to 1150°F and to color match, have the same corrosion resistance and respond to heat treatment identically with standard 355 aluminum alloys.

For More Details Circle No. 3—Page 269

Metal Surfacing: American Metaseal Mfg. Corp., West New York, N. J.—Process applies the theory that controlled surfaces are better than very smooth surfaces to reduce friction, dissipate heat and prevent moving metal parts from seizing, sticking or burning. It consists of shooting special abrasive suspended in liquid, in a controlled high pressure spray against a metal surface. The spray produces many minute, identical "wells" which can be varied in coarseness or fineness by the use of several different grades of the abrasive and by changing the spray's length, force or direction. Tolerances are said to be maintained to 0.0001-in., and predetermined surfaces assertedly can be achieved repeatedly without variation. Die casting molds are said to perform better and longer after this surfacing. Illustration shows a die cast mold first as rendered unserviceable by repeated casting use and then as restored by this process. The treat-

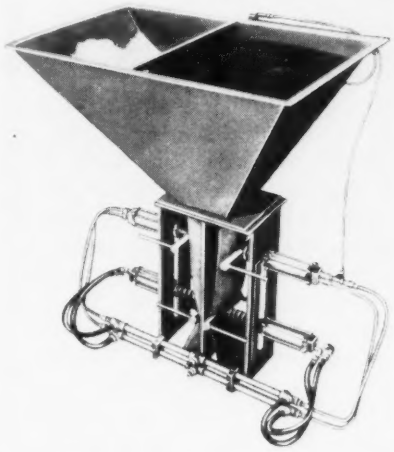
SUPPLIES

For More Details on these Items Use Reply Card—Page 269

ment also can be used to prepare metal for painting, bonding, plating and buffing and for removing heat treat scale, rust or other surface material.

For More Details Circle No. 4—Page 269

Bond Adder: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4—Unit for automatically adding bonding material to foundry sand sys-



tems consists of a reciprocating hopper of adjustable size which is operated by an air cylinder. On each stroke, the machine dispenses into the mill a measured volume of any two of the following: Clay, bentonite, cereal, wood flour, silica flour or seacoal. Material to be added is stored in two hoppers, each of which holds 150 lb of clay or seacoal. Hopper extensions, providing greater storage, are available. Quantity of material added on each stroke is adjusted by a calibrated slide. For batch type mills, the unit makes one stroke per batch. For continuous mills, it adds a constant number of measured quantities per minute.

For More Details Circle No. 5—Page 269

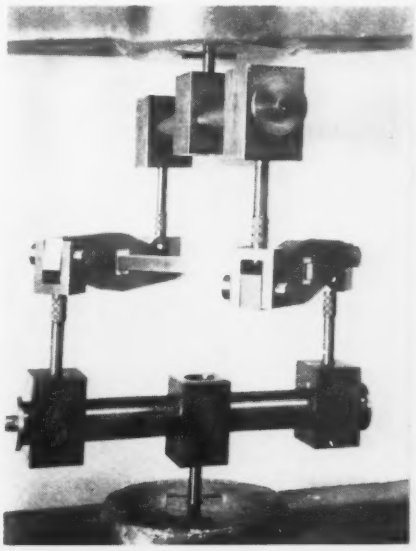
Crucible-Ladle: Electro Refractories & Abrasives Corp., Buffalo—Crucible-ladle with a coffee-pot lip extending under the metal line is said to increase efficiency of pouring aluminum. Developed jointly by Electro Refractories & Abrasives Corp. and by Bohn Aluminum & Brass Corp., Detroit, the spout is believed to be the first successfully joined to a carbon-bonded silicon carbide ladle below the metal line. The new ladle actually is a self-contained tilting furnace. It has a steel shell with a refractory lining and a gas-fired combustion area to accommodate a crucible holding 125 lb of aluminum. The lip pours a constant stream rapidly, without spillage, at 1385°F.

For More Details Circle No. 6—Page 269

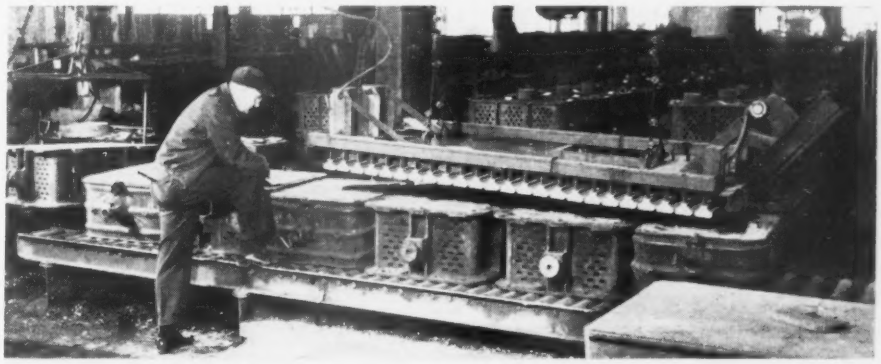
Crane Scale: A. H. Emery Co., New Canaan, Conn.—Newly designed crane scale is offered in 1000, 2000, 5000 and 10,000-lb ranges. Every scale is guaranteed accurate within 2/10 of 1 per cent of its capacity. A 25 per cent tare adjustment is provided, and complete zeroing is said to be assured. Features include one-piece housing, plastic crystal protection for 21½-in. dial, tilted dial case and an integral stand for storage. It does not employ levers, balance weights, knife edges or delicate bearings. Designed to fit any hoist or crane application, it adds 19⅛-in. to required headroom.

For More Details Circle No. 7—Page 269

Torsion Test: Baldwin - Lima-Hamilton Corp., Philadelphia 42—Torsion test device twists test specimens up to ¾ in. square and ranging from 2 to 12 in. long (plus 2 in. to be engaged by torque bars) to a maximum angle of 24 degrees. Maximum torque load is 60,000 inch-pounds, obtained by applying a 12,000-lb tension load. The instrument is furnished with hardened socket liners for specimens ⅜, ½, ⅝ and ¾ in. square or for round specimens with square ends of these sizes. Other sizes are available on special order. Ends of test specimens are secured in the centers of two parallel torque bars. Torque bars are rotated in opposite directions by four tension members pivotally connected in the ends of two equalizer bars. Pivotal connections also are provided for two spherically-headed tension rods seated in wedge block adapters in the testing machine crosshead.

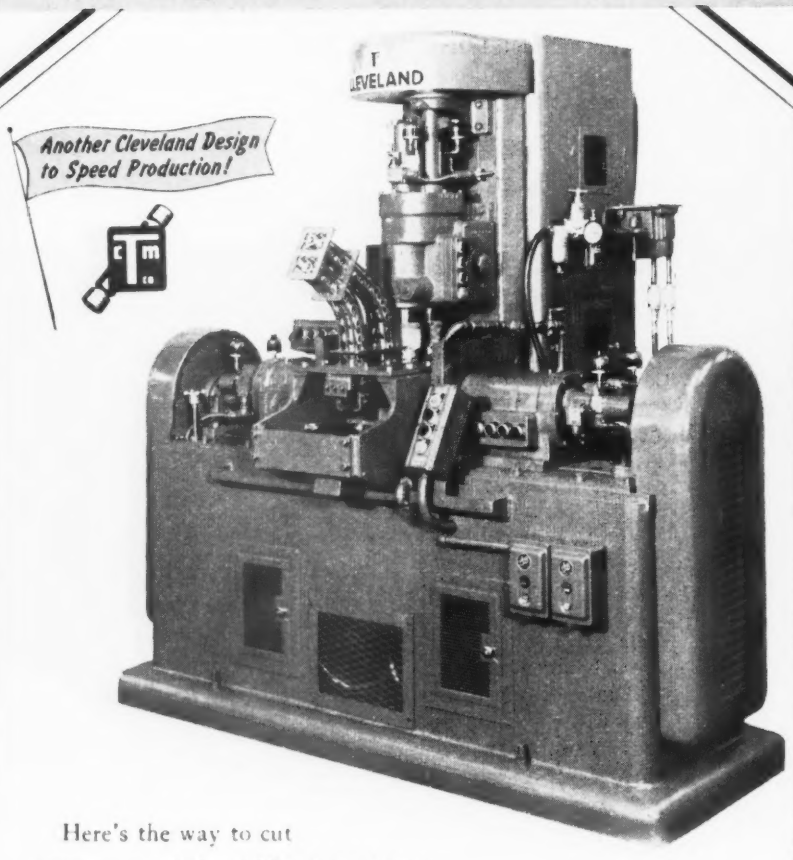


For More Details Circle No. 8—Page 269



Mold Wash Dryer: Edwin L. Wiegand Co., 7596 Thomas Blvd., Pittsburgh 8—Far-infrared electric radiant heat speeds up skin drying of molds, permits conveyorized drying and saves handling labor and floor space normally required to stack molds for air drying. Illustration shows single bank of 24 far infrared electric radiant heaters rated at 1.8 kw each which are drying wash on molds on a conveyor. Molds are dried in 7½ minutes. During drying, the heaters are lowered

1308 tee fittings per hour!



Here's the way to cut costs on tee fittings! This Model FT-1 will tap 1308 pieces ½" - 14 per hour at 100% efficiency. Also handles ¾" and 1" sizes. All spindles have their own lead screw feed—assuring the precision for which Cleveland Fitting Machines are famous. Produced parts are square and within the required tolerances. Set-up and change-over time is reduced and tap life increased up to 25%. For greater efficiency this Model may be grouped in batteries of three with one operator to each battery.

If you make fittings of any size or type it will pay you to consult Cleveland engineers. Their know-how can save you money.

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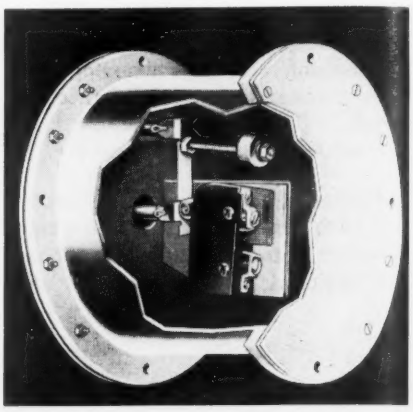
For Better Tapping - - Faster!

CLEVELAND lead **fittings machines** screw

to within a few inches of the top of the molds, but can be raised to the ceiling when not in use.

For More Details Circle No. 9—Page 269

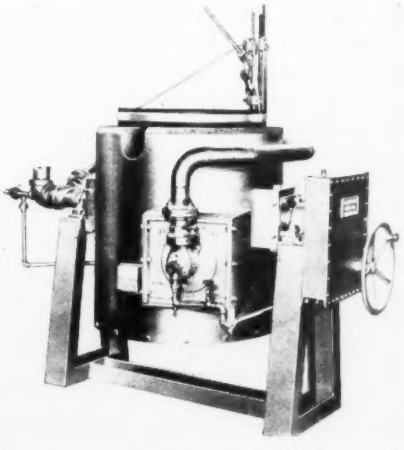
Bin Level Indicator: Bin-Dicator Co., 107-13946 Kercheval, Detroit 15—New model of small bin level indicator is reported to offer wider versatility at a lower price than the



original unit. Over-all diameter is 5¾ in., and the housing is designed so that the device can be mounted on the outside of thin-walled bins, the inside of thick-walled or multiple compartment bins or suspended within bins. Flexible 4-in. diaphragms of various types of material make the indicator applicable to practically any free-flowing material. No springs or motors are used, and no lubrication is required.

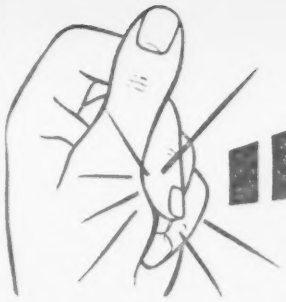
For More Details Circle No. 10—Page 269

Brass Melting Furnace: Johnston Mfg. Co., 2825 East Hennepin Ave., Minneapolis 13—Brass melting furnace available in either oil or gas fired models is designed for high capacity, rapid melting of all nonferrous metals. Gas-fired unit is said



to average 1 hr per heat for succeeding 900-lb brass heats. Using its own burners and blowers, the company claims low fuel consumption. An enclosed mechanism facilitates tilting and is designed so that an elec-

(*Continued on page* 271)



IDEAS FOR FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

75. Foundry Chill Nails

Standard Horse Nail Corp.—Samples of Koolhead foundry chill nails and spider chills in various sizes are contained in packet which also gives available size information. Styles from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90-degree bent are offered. Chills are available in steel, stainless, brass or aluminum, or copper coated to order.

76. Shell Molding Resins

Schenectady Varnish Co., Resin Div.—Metal ring-bound presentation offers general information about the Resin Div. of this company as well as basic and advanced data on shell molding and physical description of two shell mold resins. Binder is designed for removing or adding sheets.

77. Valve & Fitting Coating

Industrial Metal Protectives Inc.—Instructions for preparing and applying Zincilate No. 100 and 300 protecting coating for valves and fittings are featured in bulletin Z551. Resistant to petroleum solvents and greases, coatings have withstood 4 years sea exposure tests.

78. Portable Space Heaters

American Air Filter Co.—"Guide to the Selection and Use of Portable Space Heaters" is 36-page booklet which will aid selection of portable heating equipment. Special emphasis is given to safety features of AAF spot heaters and cartoons effectively amplify the points made.

79. Pressure Cast Products

Accurate Match Plate Co.—Purpose of illustrated 16-page brochure is threefold: to describe the variety of aluminum production pattern equipment produced by pressure casting aluminum into plaster molds; to cover the type of pattern equipment necessary for the process; and to supply a basis for estimating costs. Covered are match plates, cope and drag plates, pattern castings, dump and split boxes and other products.

80. Cut-off Machines

Buehler Ltd.—Four models of cut-off machines for the metallurgical laboratory as well as a specimen cutter assembly and recirculating cooling system receive brief description with specifications and price data in 4-page folder.

81. Pyrometers

Claud S. Gordon Co.—Range of types of Xactemp pyrometers for high and low temperature indications are covered in illustrated form XT-3-51. General purpose high and low temperature models and accessories are detailed.

82. Finishing Equipment

Newcomb-Detroit Co. — 4-page illustrated folder identified as li/Ne offers design and operational data on industrial ovens, parts washers, spray booths and dust collectors. Ovens and dust collectors are made for all industrial processes, and washers and spray booths for all requirements.

83. Ingot Mold Washes

United States Graphite Co.—Company is now offering an engineering bulletin which details "9 Ways to Increase Your Profits with Mexican." Bulletin features Mex, Volmex and 90-B ingot mold washes which will fit most needs.

84. Materials Handling

Towmotor Corp.—"Mr. Smith To See You, Sir!" is title of effective 12-page brochure which, in salesman fashion, tells about new Towmotor developments, services to customers and ways of utilizing these developments to speed up production and increase profits.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

10-53

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85. Core Coating

Frederic B. Stevens Inc.—A graphite base coating, No. 114 core coating for grey iron castings has actually "licked" many tough jobs, says this 4-page illustrated folder. It can be applied by any method and stays in suspension over wide range of Baume hydrometer readings. Recommendations for use are also covered.

86. Metal Melting Furnaces

Stroman Furnace & Engineering Co.—Metal melting furnaces and furnace room accessories are cataloged in illustrated 20-page bulletin 800. Furnaces include aluminum, brass and iron melting types in capacities from 200 to 3000 lb, and accessories include oil burners, core ovens and centrifugal blowers.

87. Overhead Trolley Hoist

Industrial Equipment Co. — The Moto-Trolley overhead trolley made for attachment to standard lug mounted electric hoist is featured in data sheet MDT-1050. Trolley is made in frame sizes to accommodate 2000, 4000 and 6000-lb capacity hoists. Speed is 65 fpm.

88. Sand Preparation

Pettibone Mulliken Corp., Beardsley & Piper Div.—Combining screening, aeration and magnetic separation in one machine, the Magnarator sand conditioner is featured on illustrated data sheet. It is designed for shovel loading and is built in capacities of 20 and 30 tons of sand per hour. Other sand machines are also illustrated and briefly described.

89. Joint Seal

Whitehead Brothers Co. — Plastic and ready for use, Joint Seal is a multipurpose sealing compound lending itself to application with an air gun. Uses and properties are described in 4-page folder. It prevents runouts, and insures against thick and uneven fins.

90. Motive Crane

Hughes-Keenan Corp.—Six, ten, and twenty thousand pound capacity motive cranes are discussed in illustrated 24-page bulletin. These units are available in a wide variety of styles with differing equipment, are roadable, and can be equipped with either solid or pneumatic tires. Their construction, applications and specifications are discussed in detail.

91. High Temp. Lubricant

Acheson Colloids Co.—Dag colloidal graphite as a high temperature lubricant is described in 4-page bulletin 423. Many applications including oven conveyor and car bearings, kiln and furnace cars are individually discussed. The compound can be dispersed or suspended in a variety of carriers for different purposes and temperatures ranging to more than 2000° F.

92. Solid Abrasives

Mid-West Abrasive Co.—58-page illustrated catalog No. 27 contains wide variety of information and prices on line of solid abrasive products. Included are vitrified and silicate bonded, vitrified and resinoid bonded and resinoid bonded wheels, segments and honing and superfinishing stones.

93. Vibrating Conveyors

Stephens-Adamson Mfg. Co.—In 8 illustrated pages, bulletin 353 features various natural frequency vibrating conveyors. A unit for conveying sand and castings is shown which moves sand and castings up to 100 lb in weight at speeds of 85 ft per minute. It automatically separates sand and castings at the end of its run.

94. Dust Collectors

Peters-Dalton Inc. — Hydro-Whirl wet dust collectors, the subject of 16-page illustrated bulletin 101, are impingement and centrifugal type collectors which precipitate the material to be collected in the liquid. Applications are for buffing, grinding, molding and foundry work of various types.

95. Handling Equipment

Allis-Chalmers Mfg. Co., Tractor Div.—Variety of applications for Allis-Chalmers materials handling equipment are shown in 12-page well-illustrated brochure MS-916-535. Included are wheel and crawler tractors, scrapers, graders, earthmovers and power units, plus tractor attachments.

Only a few of the following reprints are available, your requests having about depleted our stocks. We're listing them here, on a first-come, first-served basis. When they are gone, "there ain't no more."

96. "Casting 100,000 Valve Seat Inserts Daily"
97. "Community Relations — Management's Responsibility"
98. "Company Mobilization Planning"
99. "Develops Foundry Apprentice Program"
100. "Production of Aluminum-Nickel Bronze Sand Castings"

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12	27	42	57	72	87	102	117	132	147
13	28	43	58	73	88	103	118	133	148
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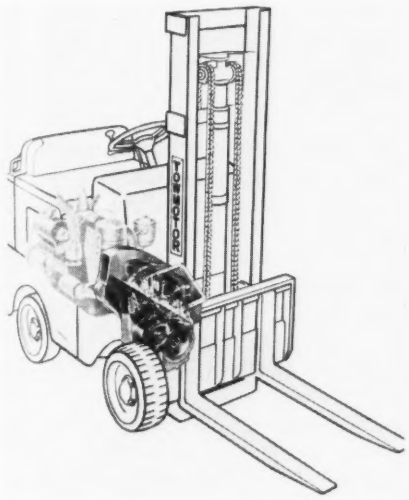
(*Continued from page* 268)

trical drive can be applied. Trunnions of a large pillow block bearing at the main pivot are adjustable for best balance. Silicon carbide linings are backed with insulating brick. The cover lifting mechanism is operated from the front of the furnace.

For More Details Circle No. 11—Page 269

Torque Drive: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Torque drive for the company's fork lift trucks features simplicity of design and construction. It employs a heavy duty air and oil cooled torque converter in a capacity range to



match the requirements of varied power plants. A duplex, directional designed clutch teams up with a constant-mesh gear train to assure fast and smooth operation without gear shifting. Flipping a lever on the steering column provides positive control of forward or reverse movement. A creep control pedal permits inching the truck as desired, enables the operator to accelerate lifting of the carriage during creeping and serves as an emergency drive-stop.

For More Details Circle No. 12—Page 269

Welding Control: General Electric Co., Schenectady 5, N. Y.—Synchronous-precision control for resistance welding of hard-to-weld metals regulates the value of the current and the length of time it flows. Control was developed for use in welding stainless steel, aluminum, magnesium and other nonferrous alloys with a short plastic range; for use where good welds with few rejects are necessary to keep production at peak capacity; and where varying weld quality is not acceptable. It can be used on motor, fluid or air operated welding machines. Basic components are an ignitron contactor which acts as a switch to turn weld current on and off and a weld timer and phase-shift heat con-

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2. **LOWER COST:** higher percentage of "on-the-job" time results from no clutch problems, "cushioning" effect on motor and drive members.
3. **GREATER SAFETY:** hydraulic brake system, linked to torque converter, automatically cuts power; engine cannot be started unless controls are in neutral.
4. **IMPROVES DRIVER EFFICIENCY:** finger-tip direction control and elimination of gear-shifting conserves operator energy.

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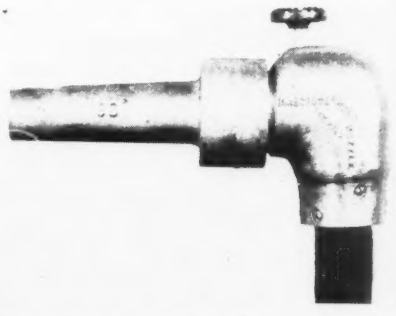
trol. If required, a sequence timer controls steps in the welding cycle. Other features include surge resistors, one-piece silverplated copper bus bars; and positioning of the terminal boards at an angle on the side of the panel, for easy access. Ratings for the control are 180-280/240-510 v, 60 cycles.

For More Details Circle No. 13—Page 269

Fire Extinguisher: American-LaFrance-Foamite Corp., Elmira, N. Y. Trigger operated, 1-qt fire extinguisher is said to offer extra protection against incipient Class B and C fires. It is a stored pressure unit charged with bromochloromethane, more commonly known as CB liquid, which is a fast acting, vaporizing liquid reported to be very effective on inflammable liquid and electrical fires. Designed for one-hand operation, the extinguisher can be aimed like a gun. For repressurizing, a standard air chuck can be used. Manufacturer reports that the extinguisher can operate satisfactorily at high and low temperatures and in sand, dust, humidity and salt spray. It will not freeze down to —65 F. In any position from vertical to within 15 degrees of horizontal, 95 per cent of contents are discharged.

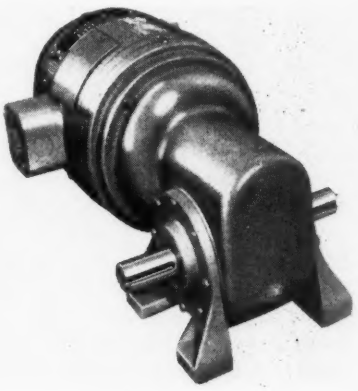
For More Details Circle No. 14—Page 269

Gun Nozzle: Blastcrete Equipment Co., 11154 Santa Monica Blvd., Los Angeles 25—Constructed on a 90 degree angle turn, nozzle for shooting refractory materials is said to improve operating conditions greatly wherever refractories are being shot and to provide the means for working in confined areas such as reverberatory and converter furnaces, cupolas lined down to 24 in., ladles and troughs. Designed principally for use with the company's gun, the nozzles also are available for use with any other make of gun on the market.



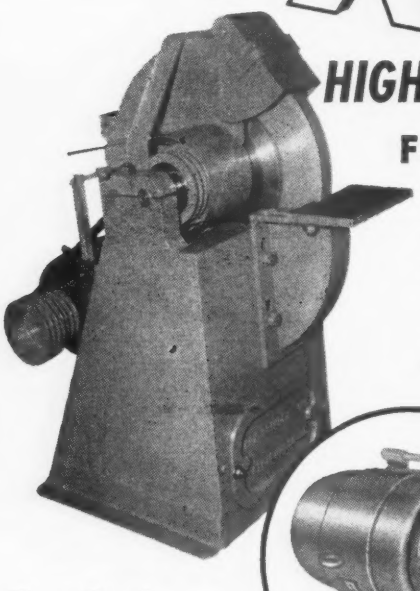
For More Details Circle No. 15—Page 269

Motor Reducer: Reuland Electric Co., Alhambra, Calif. — Right-angle motor reducer is meant to convert a motor's high speed into a low-speed, high-torque output. Its right-angle worm gear feature is stated to reduce cost and to permit greater versatility in mounting and load hookup. As many as three output shafts can be used from the same motor—one high-speed take-off directly from the motor shaft and two low-speed take-offs from the reducer. The drive motor can be standard squirrel cage, slip ring, multispeed or fluid shaft in drip-proof, splashproof or totally enclosed designs. All units are available with through-shaft, automatic magnetic brakes and with horsepow-



FOX

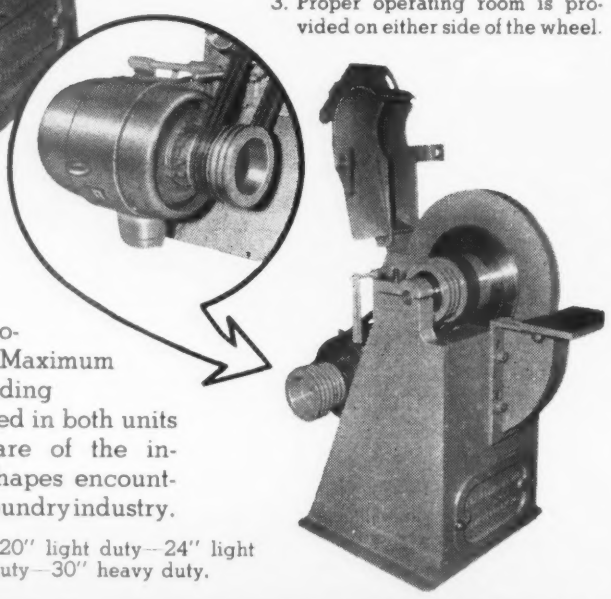
HIGH-SPEED STAND GRINDERS



HIGH-SPEED PRODUCTION FOR THE FOUNDRY

Three important reasons why FOX Grinders are designed as single-wheel machines:

1. Speed changes can be made at the proper wheel diameter.
2. Less space is required for each installation.
3. Proper operating room is provided on either side of the wheel.



These Stand Grinders have been designed for use in foundries where high-speed production is required. Maximum clearance at the grinding face has been provided in both units to properly take care of the innumerable casting shapes encountered throughout the foundry industry.

Comes in 4 sizes: 20" light duty—24" light duty—24" heavy duty—30" heavy duty.

FOX GRINDERS, Inc.

OLIVER BUILDING PITTSBURGH 22, PA.

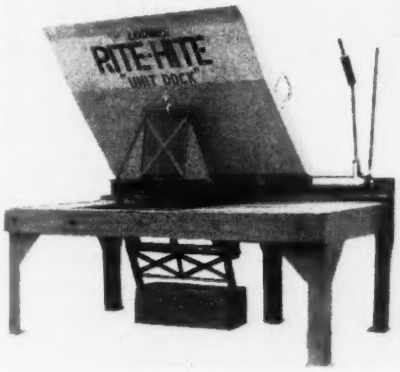
er ratings of ½, ¾, 1 and 1½, with speed reductions, respectively, to as low as 18, 24, 36 and 58 rpm.

For More Details Circle No. 16—Page 269

Hot Plate: Lindberg Engineering Co., 2444 West Hubbard St., Chicago 12 — Portable hot plate features sheathed nichrome heating elements cast into the aluminum top plate, insuring quick heating (750° F in 35 minutes), good uniformity and long element life. "Stepless" control permits precise control of temperature. Terminals are protected from spillage and short circuits. Plate has top plate and base diameters of 8 in.; power rating of 660 w; and power service of 115 v, 50-60 cycles. Shipping weight is about 10 lb.

For More Details Circle No. 17—Page 269

Loading Docks: Loomis Machine Co., Fourth & Pine Sts., Clare, Mich.—Completely manually operated, self-contained loading docks with both vertical and horizontal adjustment can be installed in front of an existent dock or be recessed in dock area. They compensate for variation between truck and dock heights and insure true carrier approach. Ramp is made with safety tread and features side plates to prevent handling units from slipping off. Sliding plates have been eliminated. All-steel unit has 20,000-lb rated capacity. Lack of piping, pumps, motors, lubrication and machinery is reported to cut maintenance problems.



For More Details Circle No. 18—Page 269

Rubber Hose: Hamilton Rubber Mfg. Corp., Trenton 3, N. J.—All-purpose rubber hose is built with an abrasion-resistant cover to withstand sunlight and weather checking and is inseparably bonded to an oil-resistant tube. Braided rayon cord reinforces the hose, which is said not to be deteriorated by oil, grease, gas, weak inorganic acids and alkalies, acetylene or any paint, except lacquers. Hose is available in any desired length or in 500-ft bale quantities, in red or black covers and in ¼ to 1½-in. ID. Working pressures vary from

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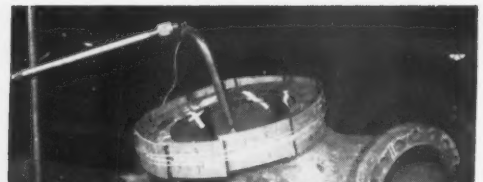

Radiographing a flange on a heavy steel casting.

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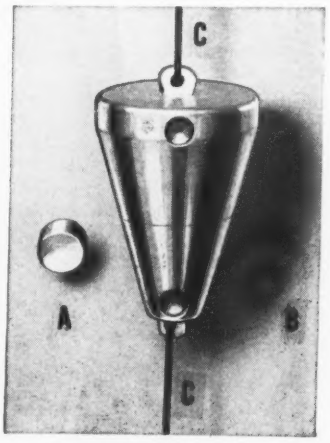

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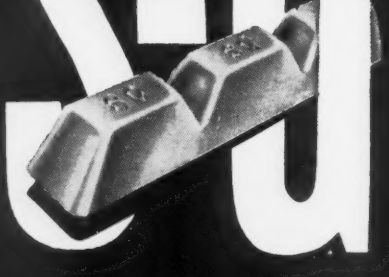

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125 psi in the 1½-in. ID to 300 psi in smaller diameter. Either 1, 2 or 3 braid construction is available.

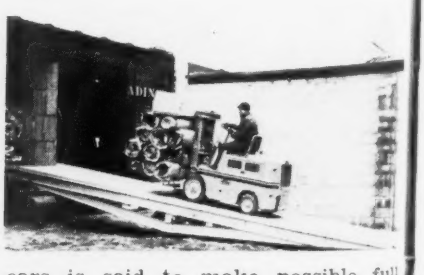
For More Details Circle No. 19—Page 269

Gagger Bars: Joseph T. Ryerson & Son Inc., Box 8000-A, Chicago 80—Gagger bars made of Hi-Bond steel are said to help to make good, firmly held molds. Double reverse helical

rib pattern is scientifically designed to afford maximum mechanical grip and the greatest bonding surface area for a given cross section of gagger bar. It permits a uniform grip all along the bar surface, allowing sand to pack firmly and evenly around each gagger and to hold the mold together securely. The bars are easy to handle and reportedly are more readily formed, straightened and reformed than twisted squares. They are furnished in convenient lengths or can be secured cut and bent to any specified form.

For More Details Circle No. 20—Page 269

Loading Ramp: Magline Inc., Pinconning, Mich. — All-magnesium loading ramp designed primarily for use in facilitating loading of yard



cars is said to make possible full utilization of power trucks in loading operations. Engineered to support loads of 13,000 lb per axle, or more where required, the ramp is 6 x 30 ft, yet can be moved by one man. An hydraulic lifting mechanism allows it to be raised to any car level quickly and easily, and a safety lock anchors it securely during loading. A retractable trailer hitch permits power towing for long distance mobility. The unit also is used where dock facilities are crowded or nonexistent.

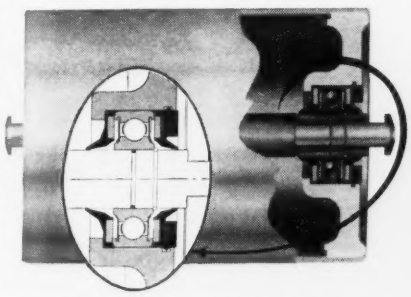
For More Details Circle No. 21—Page 269

Glass Cleaner: Hygiene Research Inc., 684 Broadway, New York—Chemically treated cloth simultane-

ously cleans and mistproofs glass and transparent plastic. Wiping surfaces of either of these materials with the cloth cleans it and mistproofs it for from a few hours to two weeks, depending on atmospheric conditions. Cloth can be used over and over and is said to remain effective for several months of use. It is packaged in 8 x 9 in. pieces for goggles and in larger pieces for larger surfaces. Special sizes are made to order, and the material also is sold by the yard.

For More Details Circle No. 22—Page 269

Belt Conveyor Idlers: Transall Inc., 160 North Eleventh St., Birmingham 4—Improvements have been made in the design of the company's heavy duty, permanently lubricated belt conveyor idlers. Construction



features include molded bearing cavity closures on both sides of each bearing for protection against abrasives and moisture. The improved, precision type heavy-duty bearing is permanently sealed and packed with premium quality synthetic lubricant and is mounted so that any possibility of axial preloading in the assembly is eliminated.

For More Details Circle No. 23—Page 269

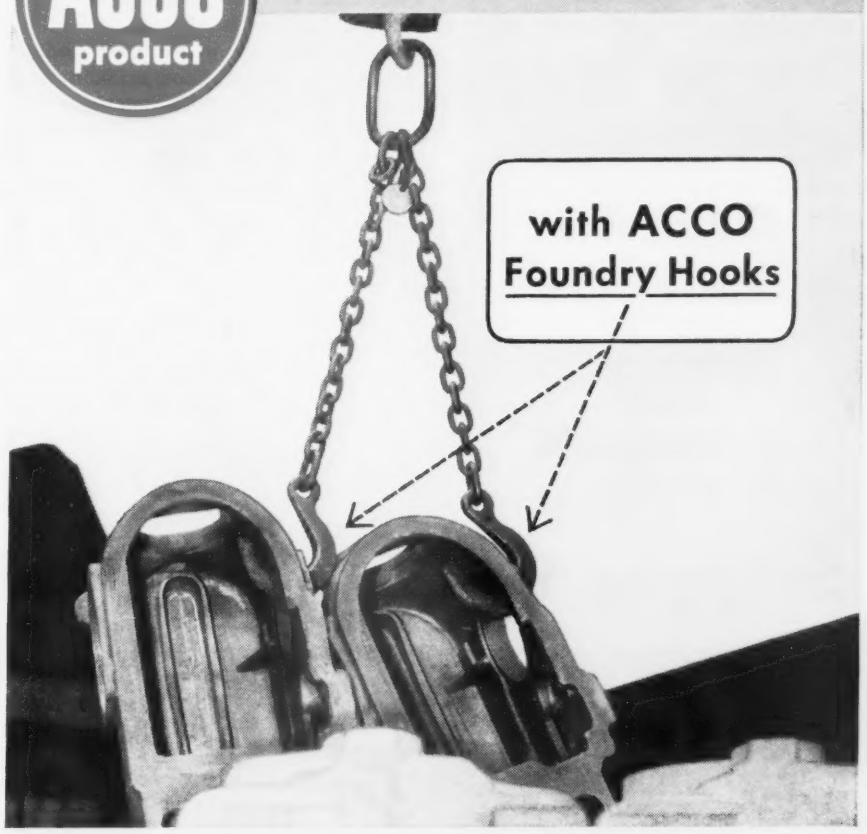
Goggles: Willson Products Inc., Reading, Pa.— Goggle for wear over prescription glasses is offered in two versions, a chipping style with clear, heat-treated lenses, and a welding goggle with a choice of filter lens shades. Molded nylon eye cups pro-

vide light weight, toughness, noninflammability and low heat conductivity. Standard 50-mm round lenses are used in both versions, and external lens retaining rings simplify lens replacement. Standard rigid metal top bar permits adjustment to face of individual user and facilitates taking the goggle off or putting it on with

an ACCO product

ENDWELDUR SLING CHAINS

with ACCO Foundry Hooks



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• Castings frequently are odd shaped and hard to hitch to with regular sling hooks. So AMERICAN developed the series 500 ACCO Foundry Hook with rounded point and wide mouth that can be hooked to a wide variety of lifts.

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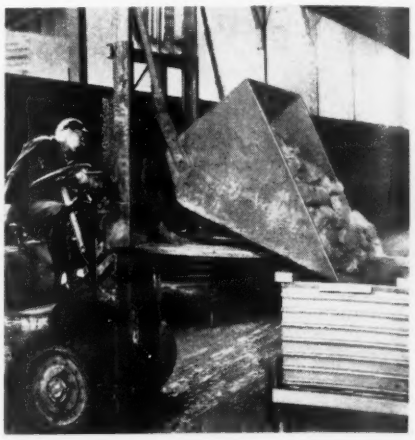
one hand. Two-piece adjustable headband and leather nose-and-bridge curtain contribute to comfortable fit. Slots in lens retaining rings and screens in eye cups yield two-way ventilation.

For More Details Circle No. 24—Page 269

Fork Lift Truck: Baker-Raulang Co., Baker Industrial Truck Division, 1230 West 80th St., Cleveland 2—Highly maneuverable, 1500-lb capacity fork lift truck is said to be capable of stacking 36-in. loads in a 6-ft aisle. Over-all length is short, but low center of gravity reportedly provides good stability. All major maintenance elements are located in a cowl directly under the driver's seat. Cover is bolted to the frame and can be removed in minutes. Elimination of the usual cowling in front of the operator gives him good all-around vision at floor level, and the offset position of the driver's seat yields him an unobstructed view of both the load and plant fixtures. Trailing axle allows the truck to "step over" uneven floor surfaces and obstructions. Over-all dimensions include length, 95 in.; width, 30 in., height, 83 in. Lift is 130 in. The truck turns in 59 in. and has a maximum travel speed of 6¼ mph. Weight without battery is 2815 lb.

For More Details Circle No. 25—Page 269

End Loading Scoop: Union Metal Mfg. Co., Canton, O.—End loading scoop can be used to convert a fork



lift truck into a "front end loader" in the 30 seconds required to attach the scoop to the truck's auxiliary lifting mast. Scoop is used to pick up, transfer and dump loose materials like sand, coke, turnings, castings and others. Dumping can be done at any height desired, and no material is lost during transit. Operation only involves raising the auxiliary mast to lower the scoop to floor level, digging scoop into pile of material and lowering the auxiliary lift. Downward force transmitted through the connecting arms lowers the scoop back and raises its edges until the scoop is completely righted.

For More Details Circle No. 26—Page 269

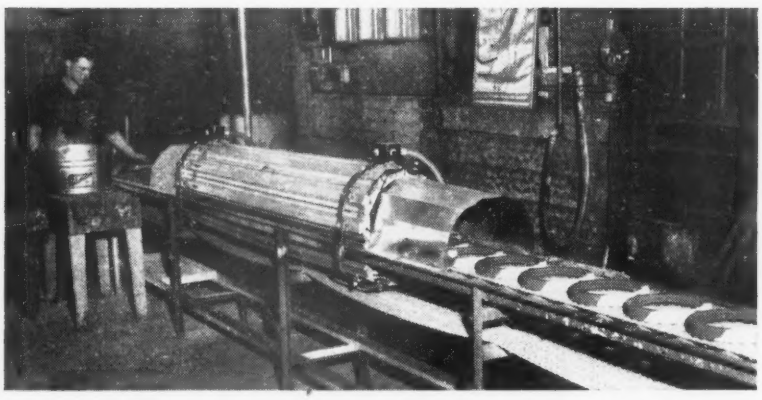
Storage Building: Yard - Stor Shelter Co., 19256 John R St., Detroit 3—Metal storage building is sectional and mounts on a track rather than on a foundation. Sections tilt from either side for easy access or can be slid apart to provide unlimited headroom for handling. Sections can be telescoped to the point that all can be nested at the ends, exposing entire contents of the shelter. Cranes are used to swing the sections in place. Applications include storage of heavy dies and large patterns and similar uses. Manufacturer is Joe Martin Co., Detroit.

For More Details Circle No. 27—Page 269

Insulating Spray: B. F. Goodrich Co., Akron, O.—Quick drying material that can be sprayed on metal like paint is reported to make the treated surface capable of withstanding tem-

Another CHROMALOX Production Tip

Core Drying Time Cut from 24 HOURS to 6 SECONDS!



PROBLEM

To speed up the drying of the dip-coat applied to cores for casting automotive parts. At least 24 hours drying time was needed under old method, and 6000 square feet of valuable floor area was used to store the cores while they air dried.

SOLUTION

The foundry installed a compact far-infrared core drying oven made of eleven 3.6 kilowatt all-metal Chromalox Electric Radiant Heaters. A 15-foot conveyor belt, variable in speed from zero to 10 feet-per-minute, moves cores through the oven at rate of 600 to 800 per hour. Cores are thoroughly dry in 6 seconds and ready for assembly.

ADVANTAGES

1—Drying time reduced from 24 hours to 6 seconds! 2—Existing core drying area including oven occupies only 200 square feet against 6000 square feet the old way. 3—Core surfaces are smooth and bubble-free with rejects practically eliminated.

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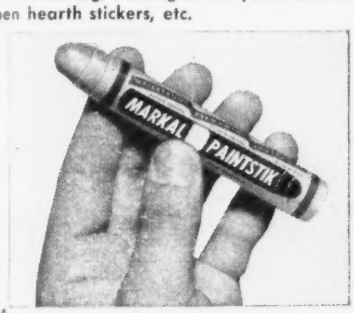
For—Extreme heat 250°F to 1800°F . . . permanent . . . comes off in pickling bath

For—Hot Metal 150°F to 1500°F . . . will not run, char, flow, discolor or peel. Immersion in cold water will not deface.

For—Annealing, welding or acetylene torch work. Open hearth stickers, etc.



For—Metal to be annealed at temperatures up to 1600°F. Marking when cold.

For—Quick Drying . . . drys instantly . . . removed in pickling bath.

For—All purposes, dry, oily, or icy wet surfaces. Stampings and indentations—steel and plastics.

For—Metal, wood, etc. 60°F to 160°F. Marks come off in pickling bath.

For—Lumber either wet, dry or green. Also for crates and boxes.

For—Lumber, wet, dry, green, creosoted or Wolmanized.

Other types are available for special marking requirements; our engineers will make recommendations if you will outline your special problem.

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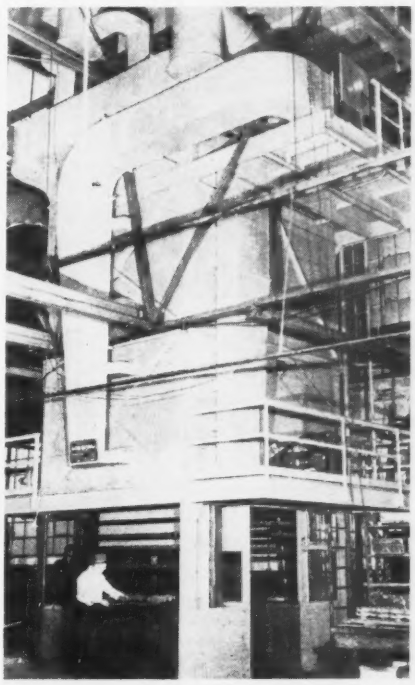
peratures as high as 5000° F. A 1/16-in. coating protects metal for as long as 10 seconds against flame temperatures hotter than the melting point of metals. Nontoxic, noninflammable and nonexplosive, it adheres directly to clean metal surfaces without sandblasting or priming, and bonds to metal with a strength that withstands sharp impact short of actual deformation of the base metal. Resistant to most solvents and chemicals, the material also withstands indefinitely temperature cycles of from minus 60° to plus 165° F.

For More Details Circle No. 28—Page 269

Core Oven: Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15—Vertical conveyor core oven with a baking capacity of from 1 to 2 tons of cores per hour is 9 ft 6 in. wide, 11 ft 5 in. from front to back and 36 ft high. Pit depth, below floor, is 10 ft. The system contains a total of 28 carriers. Heating and cooling zone carrier capacities are 14 and 6, respectively. Oven uses combination gas and oil fuel and operates at 450 to 500°F. Features include a recirculating type horizontal cross flow in the heating system; a cross flow to reduce core temperatures to handling temperature; sealed combustion chamber to prevent hot combustion gases from going directly into oven; heater inside oven, between conveyor strands; heat fan inside oven; and easy access to carriers.



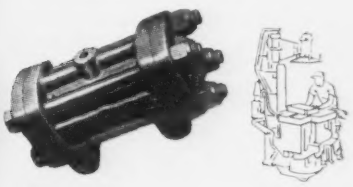
For More Details Circle No. 29—Page 269

Powder Lance: Linde Air Products Co., Division of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17—Powder lance that

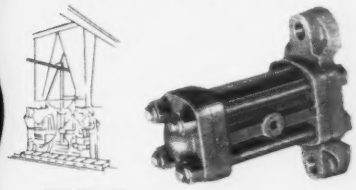
SPECIFY SPO AIR VIBRATORS

SERIES 77
Matchplate patterns are removed quickly and efficiently from sand molds with this compact, dependable unit. Simple nut and bolt mounting arrangement permits rapid attachment and facilitates interchangeability to other installations.

SERIES 79
A multi-purpose vibrator sturdily constructed for long operation, this powerful unit is recommended for shakeout, hoppers, tables, screens and many diversified types of equipment. Standard and long stroke models available to meet individual requirements.



SERIES 80
This powerful heavy-duty vibrator increases production efficiency of molding machines . . . incorporates high-strength cast semi-steel body for long, hard usage.



SERIES 81
Designed for all types and sizes of storage bins, hoppers and chutes handling powdered or granular materials, this unit delivers powerful, hammer-like blows . . . prevents arching-over or plugging . . . assures a steady flow of materials.

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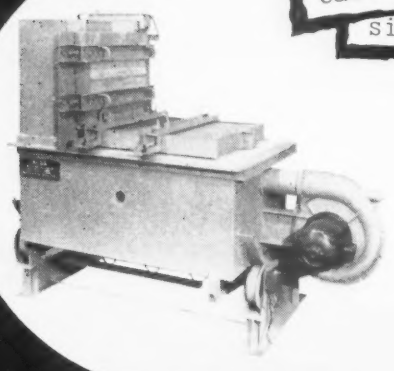
for Better Melting

Here's what Industry has to say about REDA melting Furnaces . . .

nothing but praise for the REDA FURNACE . . .
has improved overall foundry operation . . .
doing a wonderful job . . .
much more flexible . . . entirely satisfactory .
castings come cleaner . . .
sincerely recommend it . .



Reda Stack-Loading melting furnaces for ferrous and nonferrous metals have been designed and built by experienced foundrymen for foundrymen everywhere. That is why Reda furnaces provide advantages far beyond those found in other, and more expensive types; that is why, with Reda furnaces there is less down time for maintenance, longer uninterrupted melting runs, and lower melting costs.
Another feature is the Reda Burner arrangement which can operate from oil and gas simultaneously or be switched from one fuel to the other instantly. *Write or phone for complete details.*

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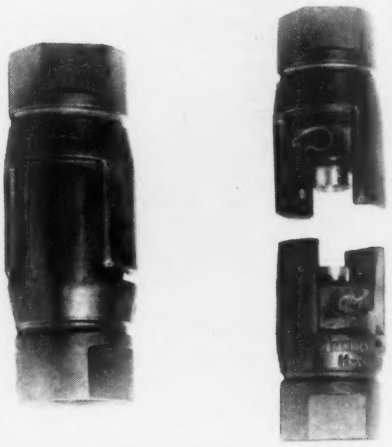
automatically mixes oxygen and powder in correct proportions can be used with any standard lance pipe in single lengths or in multiple lengths up to 63 ft. One lever controls flow of both oxygen and powder. A thumb latch keeps valves open as desired, allowing the operator use of both hands for lance manipulation. Lance pipe holder works like a drill chuck: A twist of the wrist opens the holder, and a reverse twist locks the lance pipe in place and seals it gastight. Interchangeable holder sizes are available to fit ¼, ⅜ and ½-in. pipe. High-pressure powder dispenser with 200-lb capacity is said to provide a continuous flow of airborne metallic powder through the lance to the reaction zone. It delivers powder at conveying air pressures up to 100 psi.

For More Details Circle No. 30—Page 269

Two-Way Coupling: Twinmatic Corp., 2246 South Barrington Ave., Los Angeles 64—Two-way coupling



is said to insure positive shutoff of air pressure when air hose connections are disconnected. Spring seated valves automatically shut off air pressure and eliminate the need to open and close air valves at the compressor tank. Accidents caused by high-pressure air in the hose after its disconnection are reportedly eliminated, and foreign particles are prevented from entering and traveling into air tools since both hose couplings are sealed. Brass valves and seats are employed, and coupling bodies are made of 356-T6 aluminum. Anodizing the aluminum assertedly enables it to withstand salt water spray tests for 1000 hr.

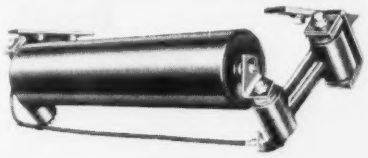
For More Details Circle No. 31—Page 269

Gearmotors: Century Electric Co., 1806 Pine St., St. Louis 3—New series of from 1 to 15-hp gearmotors includes motors with a wide range of speeds in single, double and triple gear reductions. Gears meeting AGMA Class I, II and III specifications can

be had to fit varying load requirements. Motors are available with constant or variable speeds and with protective frames to operate under most atmospheric conditions.

For More Details Circle No. 32—Page 269

Return Idler: Chain Belt Co., Milwaukee 1—Conveyor belt training return idler provides automatic align-



ment for the return strand with the use of side guide idlers. It consists of a dead-shaft roller bearing return roll, mounted at each end to a togglelike arrangement of swivel arms suspended from the conveyor framework at an angle of about 45 degrees in the direction of the belt travel. Lateral movement of the belt to one side results in increased weight on that side which, due to the idler construction, causes that end of the roll to move forward and downward. At the same time, the opposite end of the roll is moved backward and upward, and this changing of the normal position of the roll with the belt guides the belt back to the central position.

For More Details Circle No. 33—Page 269

Steel Pots: Eclipse Fuel Engineering Co., 1002 Buchanan St., Rockford, Ill.—"Metalized" pressed steel pots for heat treating furnaces are said to possess very long lives. They

are manufactured with three types of metalized coatings, for temperatures up to 1500°F for from 1500 to 1700°F and for 1700°F and over. The resistant coatings are said to protect the pressed steel surfaces against heat oxidation and scaling caused by the hot gases that occur in high temperature heat treating.

For More Details Circle No. 34—Page 269

Induction Melting Furnace: G. W. B. Electric Furnaces Ltd., Dudley, Worcs., England and Wild-Barfield Electric Furnaces Ltd., 72 Grenville Street, Toronto, Canada—Furnace is made in seven sizes for

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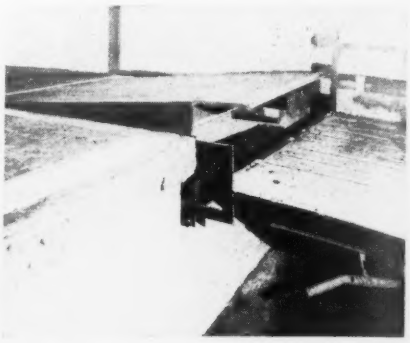
melting iron at the rate of 143 to 1980 lb per hour; in eight sizes for aluminum and light alloys, 110 to 1760 lb per hour; for copper and copper alloys nine sizes from 66 to 3960 lb per hour. Furnaces in the first classification may be utilized for melting cold stock or in connection with a cupola for superheating. In this furnace, designed by Forni Elettrici A. Taglia Ferri, Milan, Italy, the ducts are horizontal and placed at the rear. On the larger sizes the load is two-phase, with two transformers and two melting ducts. To facilitate continuous performance, a second body is supplied. By using a small inductor unit the metal pattern for forming the duct is kept hot to dry the lining when the furnace is out of commission. The horizontal slots facilitate body changeover. Inductors, cooling fans and tilting mechanism are separate from the furnace body. Removing the closing bar of the magnetic circuit permits lifting the used furnace off its electrical equipment. The new furnace may be started without the aid of molten metal. Charge material usually is introduced through a rear door. A large cover on top of the furnace may be lifted by the crane where large pieces of metal are to be melted.

For More Details Circle No. 35—Page 269

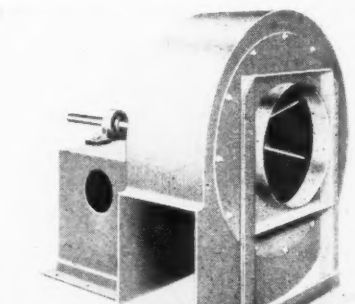
Dockboard: Dockboards Inc., 316 East Silver Spring Drive, Milwaukee 11—Dockboard automatical-



ly adjusts itself to truck bed without power. As it is backed into a dock, the truck presses the extended operating lever shown in the illustration, thus lowering the dockboard to the truck bed. Several models are available, including units for installation in new or rebuilt docks and a new packaged unit built to the specific dock height and shipped ready to operate after the counterweight has been hung.

For More Details Circle No. 36—Page 269

Exhaust Fan: Dependable Machine Co., Greensboro, N. C.—Company has added to its products a complete line of extra-heavy duty exhaust fans designed specifically for removal of sawdust, shavings, chips,



dust and wood scraps. Constructed of heavy gage steel, they are rigid and compact. Side plates are removable so that the housing can be rotated to give any arrangement needed for the discharge unit. Interchanging of side plates allows rotation of the fan to be changed. Blast wheels are of open type construction, and the long, heavy steel blades have extra braces, solidly welded into a single unit. All wheels are statically and

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dynamically balanced. Both heavy duty, dustproof ball bearings are located on one side, out of reach of grit and dust. Steel shafts are turned, ground, polished and key-seated to accommodate the drive pulley. Fans are made in standard, six-bladed models from 20 to 80-in. sizes and in slow speed, twelve-bladed models from 30 to 80-in. sizes.

For More Details Circle No. 37—Page 269

Micrometer Check Set: DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.—Micrometer checking set designed for 1 and 2 in. micrometers includes three gage blocks, 0.2500, 0.6500 and 1.000 in. These can be used individually or in combination to check accuracy of micrometer screws at various points in their

travel. Two optical parallels of fused quartz, part of the set, provide a method for checking condition on the micrometer spindle and anvil faces. When a parallel is held between the gaging surfaces of the micrometer under a monochromatic light, the fringe lines appearing on the micrometer gaging surfaces can be read to determine deviation from flatness, parallelism or squareness of the spindle faces to the spindle axis. One parallel is 0.500 in. thick and the other 0.5125 in., permitting optical checks of the spindle at two points in its rotation, 180 degrees apart.

For More Details Circle No. 38—Page 269

Casting Sealant: Tincher Products Co., Sycamore, Ill.—Plastic sealant for impregnating pressure castings is claimed to seal permanently, leaking and even squirting areas. Penetrating properties reportedly enable it to saturate all porous areas. Absence of evaporation and low shrinkage factor are said to allow the seal to maintain its bond to the casting as it hardens into a solid, nonbrittle material. The seal does not require

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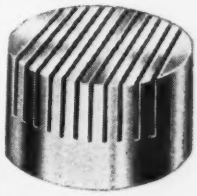

X-TRA DEEP HEAD
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Wide Slots
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DEEP HEAD
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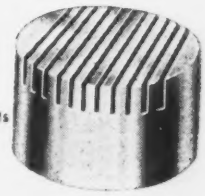

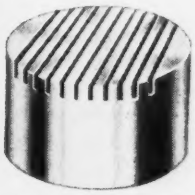

SHALLOW HEAD
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Wide or Narrow Slots
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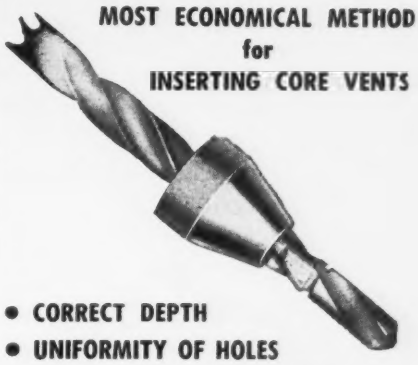

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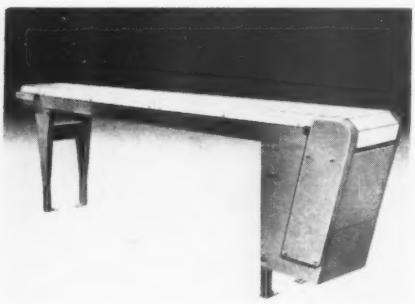
special handling or storage and can be washed off with water. It qualifies for government contracts calling for impregnation and is applied to castings by standard methods and equipment.

For More Details Circle No. 39—Page 269

Metal Belt Conveyor: M-H Standard Co., 513 Communipaw Ave., Jersey City 4, N. J.—Metal belt con-



veyor reportedly can carry loads ranging from a few ounces to 16 tons and can resist wear, heat, cold, high impact, oils and other deleterious agents. The entire belt runs on protected ball bearings. Individual metal link construction is said to eliminate belt tracking problems. Belts are available in inclined or vertical models for floor-to-floor conveying of containers weighing as much as 1000 lb each at speeds up to 200 units per minute. Horizontal conveyors are furnished for both standard and heavy duty applications in widths from 6 to 120 in. and in lengths up to 200 ft. Joints do not have pins, and no tools are required for assembly. Belt can be constructed of aluminum or stainless steel. Accessories are available.

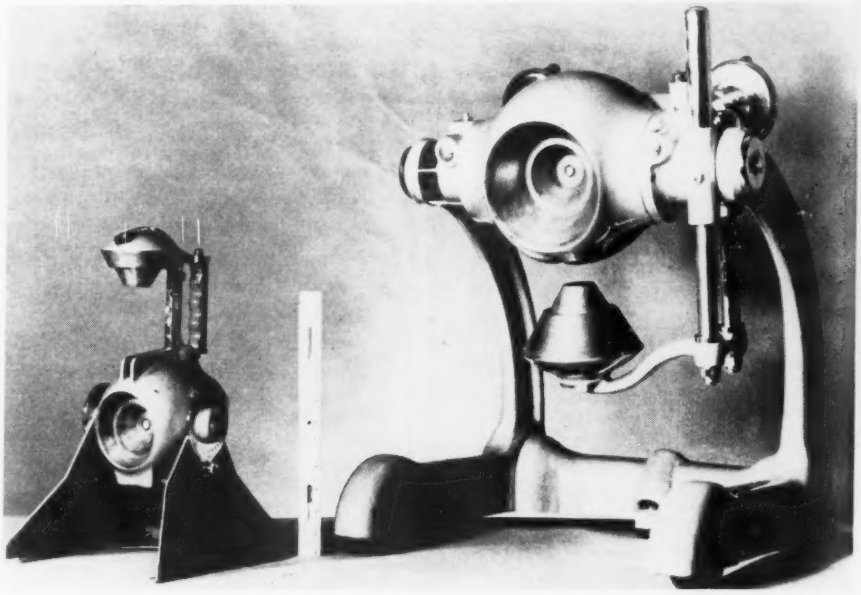
For More Details Circle No. 40—Page 269

Sweeper Attachment: Handling Devices Co., 45 Pearl St., Brookline 46, Mass.—Company's mo-

torless industrial floor sweeper now is available with left and right hand side-brush attachments which increase sweeping width by 12 in. and make possible sweeping the angle of wall and floor in either direction. As the wheels roll, a brush inside the sweeper revolves in the opposite direction, whisking dirt and debris forward into a removable aluminum hopper that one man can empty easily. A small sweeper equipped with left and right hand attachments is said to be able to sweep a 32-in. path at 20,000 sq ft per hr.

For More Details Circle No. 41—Page 269

Radiography with Gamma Rays Machines



TWO machines for holding radiation sources during radiographic work are being offered by Gamma Industries Inc., Baton Rouge, La.

The smaller of the two machines is a portable unit weighing 47 lb; it stands 11 in. high and has a capacity of 300 millicuries of cobalt 60 or the corresponding equivalent of any other isotope. The larger machine is semiportable; it weighs 190 lb and has a capacity of 5000 millicuries of cobalt 60 or equal radiation. The larger machine takes fast exposure required in line production; it has an exposure time approximately 17 times shorter than that of the small machine. Exposure time is determined by the thickness and type of material being examined, amount and type of the radioactive source and distance of sources from the object.

The machine consists of a teardrop shape lead-lined container for the isotopic source mounted on a caster-equipped steel frame. A detachable handle fits into a receptacle on the frame for moving the unit. A lead-lined plug on the container is opened and closed by a hand crank through worm gear arrangement. Another crank rotates the container through a 270-degree arc so that the opening will be pointed straight down for vertical exposures, to 90 degrees for horizontal exposures, to straight up for panoramic shots.

The source is a piece of radioactive cobalt wire 1 cm in diam by 1 cm long placed in a tubular-shaped container about ½-in. diam by 5 in. long. This container is a lead-filled chromium plated steel tube with a steel plug at one end and an aluminum capsule with a screw top at the other. The source is placed in the capsule during assembly of the unit in the manufacturing laboratory. Transfer of the source container from storage box to the gamma ray machine is acomplished with a rod about 5 or 6 ft long having a permanent magnet at one end for engaging the steel plug at the end of the container. The source tube is inserted at the back of the machine by unscrewing a cap at the point of the tear-shaped housing to reveal the holder opening.

Focal film distance of the unit is 18 in. straight down. With the source in a horizontal position the radiation will cover 960 sq in. area at a focal film distance of 24 in. The machine uses standard industrial x-ray film which is developed in the same manner as in x-ray radiography.

Efficient and safe use of the machine is simple, and requires only a few hours of instruction for the average operator.

The gamma rays machines are so designed and shielded that a person

(*Continued on page* 284)

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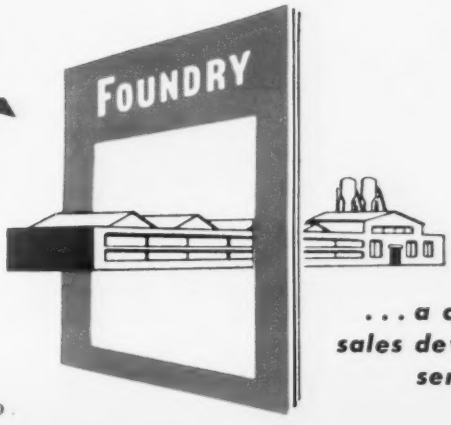

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Of course, the assumption isn't tenable on account of demurrage if for no other reason. But it illustrates the absurdity of wasting manpower shoveling sand—or coal, grain, limestone, wood chips, or anything else.

This Neff and Fry Silo is used by the Michigan Silica Co., Rockwood, Mich., for storing dry silica sand. It is 24′ x 50′ and will hold approximately 50 carloads. Sand is spouted into the silo from the processing plant. For loading into cars, the sand flows into a boot from where it is raised by a bucket elevator to a chute. Another Neff and Fry silo is used by the same company for handling wet sand.

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(*Continued from page* 282)

may stand as close as 3 ft, 9 in. off the rear of the large, loaded machine for as long as 8 hr without exceeding the limitation of radiation dosage imposed by the Atomic Energy Commission and subscribed to by the medical profession.

Radiography as employed in the inspection of castings, uses either x-rays or gamma rays. Gamma rays are in the middle bracket on the x-ray spectrum, and radium is one of the older sources of such rays. The development and widespread availability of nuclear reactor-produced artificial radioisotopes, which are by-products of uranium piles at U. S. Atomic Energy Commission facilities at Oak Ridge, Tenn., offer additional tools for use in radiography. Artificial isotopes are made by inserting into the uranium pile various elements to be irradiated.

Among these artificially produced gamma ray sources which have the desired degree of energy in their gamma radiations for use in radiographic work are cobalt 60, iridium 192 and cesium 137. Cobalt has been one of the more popular substances used in radiography because of its availability, relatively low and high output of gamma rays unit weight.

Half-life Is 5.3 Years

Cobalt has a half-life of 5.3 years. This means that at the end of 5.3 years, the intensity of radiation for a given cobalt 60 source is half that of a new source. Energy of the rays, however, does not change. It's just like operating 100-w and 50-w bulbs on a household circuit. Both operate on the same voltage (energy) but one provides half the intensity.

The half-life of iridium 192, on the other hand, is only 74 days. Cesium 137 is a brand-new isotope just now becoming available. Its half-life is 37 years, and it can be used as a substitute for short-lived iridium.

The gamma radiation from cobalt 60 is described as a "hard" ray having high penetrating power which suits it for radiographic inspection of the denser metals. Its rays will penetrate 8 in. of steel. However, it does not work as well on steel with section size less than ¾-in. or on less dense materials such as the light metals. Iridium 192 and cesium 137 give off a softer gamma ray and therefore are more adaptable for radiographing the light metals and thin sections of the denser metals.

The most commonly used gamma ray examination technique is to

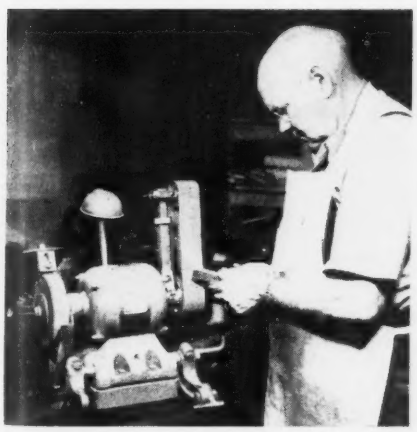
beam the radiation through the specimen against the film either in a vertical or horizontal position. Another method is the panoramic exposure for radiographing a number of specimens simultaneously by arranging them in a circle around the machine. Still another technique is to protrude the isotope from the gamma rays machine into the interior of pipes, tanks or a casting opening that is ⅝-in. or greater in diameter.

Protrusion of the source for making 360-degree panoramic exposures or for inserting the source into the openings in the material to be examined is done by a 12-ft remote control cable. One end is attached to the machine, and the operator standing at the other end, snaps a button on the cable to raise the source.

Problems of handling and the question of health hazard usually come to mind when the use of radioisotopes are considered. Isotopes are as safe to handle as electricity; both require certain simple precautions. Furthermore, subjection of the ordinary metals used in the metalworking industry to gamma rays will not make them radioactive.

More Details Circle No. 42—Page 269

Belt Grinder: Curtis Machine Corp., Jamestown, N. Y.—Portable air-driven belt grinder can be clamped



on lathes, milling machines, drill presses or pedestal grinders to do work quickly on jobs that do not warrant setting up a machine. It uses balanced rubber covered contact wheels in various diameters, widths, and hardnesses and soft or hard cloth wheels. The unit is of rigid, lightweight steel construction and features universal attaching clamps and an abrasive belt tracking and tensioning mechanism. One model uses abrasive belts up to 1 in. wide and weighs 2¼ lb. Another takes belts up to 2 in. wide and weighs 2½ lb.

For More Details Circle No. 43—Page 269

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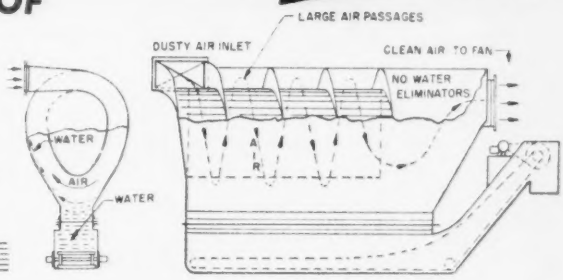

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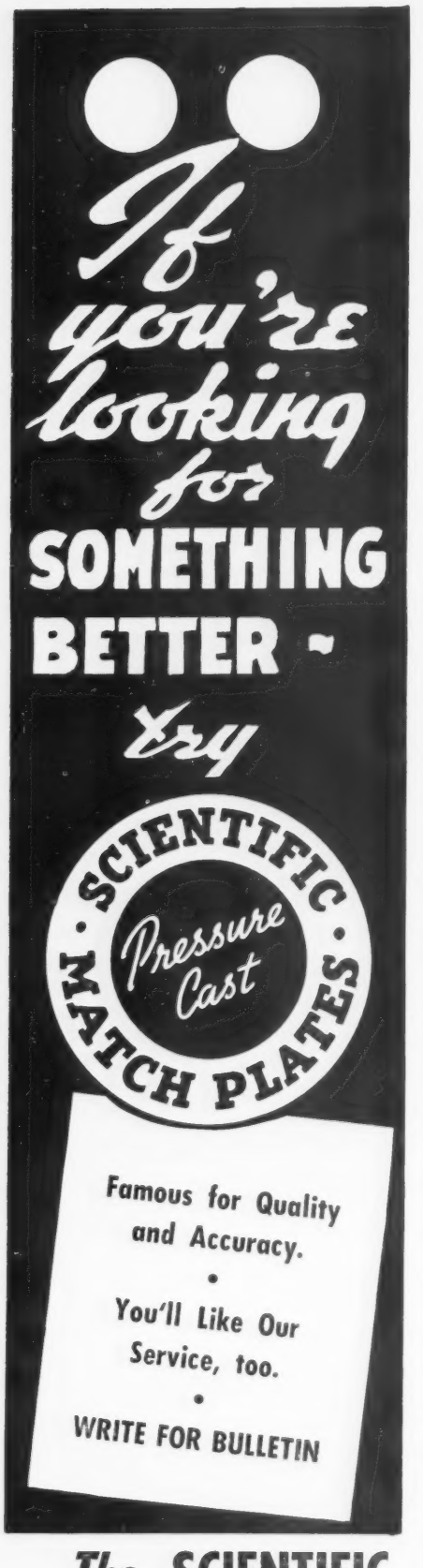

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For more details on these items use reply card—page 269

CASTING LOSS: R. Lavin & Sons Inc., 3426 South Kedzie Ave., Chicago 23—The June-July, 1953, issue of *The Lavingot* features material by William B. George, metallurgical engineer for the company, on the subject of why castings are lost. Over 20 different causes are analyzed.
For More Details Circle No. 101—Page 269

MEASURING EQUIPMENT: General Electric Co., Schenectady 5, N. Y.—Catalog GEC-1016A contains information on more than 115 testing and measuring devices for laboratory and production line use. A brief description of each product and its field of application, condensed tables of important characteristics and prices indicate whether or not the device is suited for a specific job.
For More Details Circle No. 102—Page 269

ELECTRODES & RODS: Alloy Rods Co., York, Pa.—Bulletin AR53-20 on hard-facing electrodes and rods is written from the "how-to-do-it" standpoint. Three pages are devoted to an application guide citing wear parts, types of wear and the correct electrode or rod to use in 13 major industrial applications, on about 75 common types of hard-facing problems.
For More Details Circle No. 103—Page 269

POWER TRANSMISSION: Chain Belt Co., Milwaukee 1—Abbreviated catalog 53-110 consists of information about cast and steel chains, cast tooth sprockets, belt conveyor idlers and spray nozzles. It is intended for designers of equipment using sprocket chains and power transmission machinery and for purchasers of this material.
For More Details Circle No. 104—Page 269

MAGNETIC PULLEYS: Dings Magnetic Separator Co., 4740 West McGeogh Ave., Milwaukee 14—Catalog C-1007A discusses operation, applications and advantages of permanent magnetic pulleys as separators of tramp iron. Photographs show typical installations, and selection and technical data are included.
For More Details Circle No. 105—Page 269

COMPANY DESCRIPTION: DoAll-Co., 254 North Laurel Ave., Des Plaines, Ill.—Booklet shows what the company is, where it is, what it does and how it operates in providing service to industry. A second booklet contains comments by users of the firm's gages.
For More Details Circle No. 106—Page 269

INDUSTRIAL HOSE: Quaker Rubber Corp., Division of H. K. Porter Co., Tacony and Comly Sts., Philadelphia 24—Bulletin describes industrial fire protection hose, including chemical and booster, single and double jacket cotton rubber lined, special flat folding type, engine suction and other types. Photographs, construction features, performance data, specifications and other points are included.
For More Details Circle No. 107—Page 269

VACUUM IMPREGNATION: F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia 20—Revised catalog 760 describes in detail a wide range of applications for the vacuum impregnation process, by which voids in porous materials are filled with a desired impregnant after air and moisture have been evacuated. Uses include the sealing of porous castings.
For More Details Circle No. 108—Page 269

BERYLLIUM PRODUCTS: Beryllium Corp., Reading, Pa.—Products directory describes the company's beryllium products, including pure metal, oxide and alloys. They include beryllium master alloys, beryllium casting ingots and others.
For More Details Circle No. 109—Page 269

AIR COMPRESSORS: Davey Compressor Co., Kent, O.—Bulletin presents full data on air compressors ranging from 10 to 100-hp sizes with displacements of 55 to 540 cfm. A comprehensive table shows the number of industrial tools which can be operated by a compressor of each size.
For More Details Circle No. 110—Page 269

CAR HANDLING: Whiting Corp., Harvey, Ill.—Bulletin T-112 discusses improved operational features of the company's gasoline powered switcher and explains how it can help users to achieve lower cost freight car handling. Applications, specifications, performance and dimension tables are included.
For More Details Circle No. 111—Page 269

CENTRALIZED LUBRICATION: Farval Corp., 3249 East 80th St., Cleveland 4—Bulletin 26 panoramically presents pictures and text describing various systems of centralized lubrication, including automatic systems. Advantages, features and other points are covered.
For More Details Circle No. 112—Page 269

BLOWERS: Billmyre Blower Division, Lamson Corp., Syracuse, N. Y.—Bulletin B-6, on centrifugal blowers and exhausters for air or gas handling, shows and discusses typical applications and presents perform-

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ance data. It gives fundamental engineering laws for blower applications as well as altitude and temperature correction factors, pressure equivalents and friction loss and velocity tables.

For More Details Circle No. 113—Page 269

PUMPS: Tuthill Pump Co., 939 East 95th St., Chicago 19—Catalog 101 covers small industrial pumps designed for lubricating, hydraulic, transfer, circulating and burning oils service. Catalog 102 deals with general purpose pumps for use with non-corrosive liquids with lubricating qualities. Each contains a pump guide and technical data.

For More Details Circle No. 114—Page 269

FORK TRUCKS: Buda Co., Harvey, Ill.—Fork lift truck fact book for truck users offers a complete presentation of the company's entire line of materials handling equipment and includes a "driver's eye view" of the operation, construction and servicing of the company's fork lift trucks. A photo sequence spotlights basic operating features and improvements.

For More Details Circle No. 115—Page 269

PROTECTIVE HOODS: Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8—Bulletin 1000-1 describes protective hoods for use with dust, paint and chemical respirators and includes catalog information to facilitate ordering protective hoods and respirators together, hoods alone or replacement parts.

For More Details Circle No. 116—Page 269

VACUUM MELTING: Vacuum Metals Corp., Subsidiary of National Research Corp., 70 Memorial Drive, Cambridge, Mass.—Technical data sheets cover gas-free, high-purity copper and gas-free alloy bearing steel, free of inclusions. Reprint of a recently published technical article giving performance test data about the steel also is available.

For More Details Circle No. 117—Page 269

MATERIALS HANDLING: Barrett-Cravens Co., 4609 South Western Blvd., Chicago 9—Eleventh edition of junior catalog 535 contains information, illustrations and specifications on a full line of equipment for "floor level" handling of goods and materials, including new equipment developed since the tenth edition was issued.

For More Details Circle No. 118—Page 269

DIE-FORGE CASTING: Lewis Welding & Engineering Corp., 62 Interstate St., Bedford, O.—Bulletin 103 contains a detailed descripton of a die-forge casting machine which features a 200-ton hydraulic clamping mechanism. Photographs show

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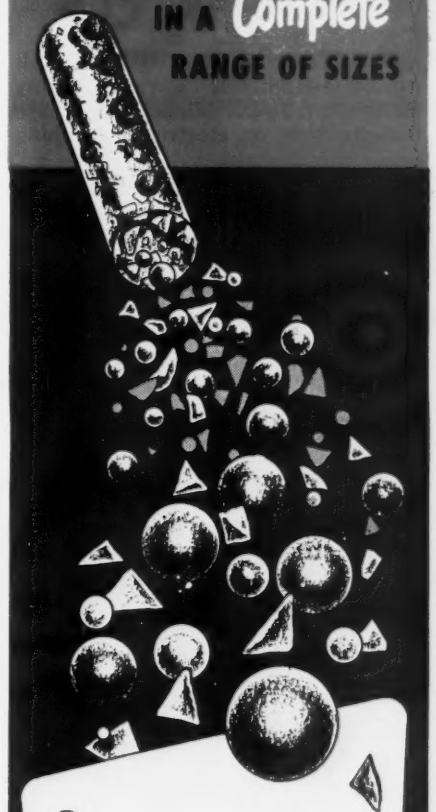

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the unit, its components and castings it produces. Specifications are listed on a quick reference chart.
For More Details Circle No. 119—Page 269

CRUCIBLE FURNACES: Eclipse Fuel Engineering Co., 1001 Buchanan St., Rockford, Ill.—Bulletin C-2 includes technical data, specifications, illustrations and other material pertaining to gas-fired crucible furnaces.
For More Details Circle No. 120—Page 269

ELECTRONIC WEIGHING: Baldwin-Lima-Hamilton Corp., Testing Equipment Dept., Philadelphia 42—Bulletin 4106 on electronic weighing of contents of tanks, bins and hoppers covers installation design considerations such as mountings; temperature effects and vibrations; indicating and recording instruments; and weighing accuracy.
For More Details Circle No. 121—Page 269

DUST CONTROL: American Wheelabrator & Equipment Corp., 1102 South Byrkit St., Mishawaka, Ind.—Bulletin 392 discusses dust control in metalworking industries, with particular attention to the use of cloth-tube type dust collectors in the ventilation of grinding and annealing operations, sprue mills and blast cleaning equipment. One section is devoted to the role of cloth filtration in such hot operations as the collection of foundry cupola fume.
For More Details Circle No. 122—Page 269

HANDLING HOSE: Hose Accessories Co., 2700 North Seventeenth St., Philadelphia 32—Booklet called "Dangers Under Pressure" advises hose users how to avoid serious or fatal accidents and how to secure long, trouble-free service life of both hose and couplings.
For More Details Circle No. 123—Page 269

MAGNETIC REEL: McCaffrey Ruddock Tagline Corp., 2131 East 25th St., Los Angeles 58—Illustrated brochure on combination magnetic reel and tagline for boom cranes lists features, shows applications and includes a table that can be used as a guide to the selection of the proper size for various boom lengths.
For More Details Circle No. 124—Page 269

AIR HANDLING: Westinghouse Sturtevant Division, Dept. T-071, 200 Readville St., Hyde Park, Boston 36—Bulletin A-53071 describes a complete line of air handling units for industrial and commercial heating, ventilating and air conditioning applications. A full line of accessories, including humidifiers, mixing boxes and filter sections, also is covered.
For More Details Circle No. 125—Page 269

TRUCK ATTACHMENT: Raymond Corp., 65109 Madison St., Greene, N. Y.—Bulletin 732-Y discusses a revolving head attachment for the company's electric trucks. Designed for 360 degree rotation to the right or the left, it is used to dump tote or skid bins in close quarters and to work in 6-ft aisles.
For More Details Circle No. 126—Page 269

CABLE CONVEYORS: E. W. Buschman Co., 4401 Clifton Ave., Cincinnati 32—Bulletin 40 shows three different types of power-driven cable conveyors—two of the overhead variety, the other a table-cable conveyor. Information is included on load limits, carrier spacing, beam specifications and other points.
For More Details Circle No. 127—Page 269

CLEANING BARRELS: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Bulletin 223-A has been revised to include specification information on new 3 and 18-cu-ft airless cleaning barrels recently added to the firm's line of blast cleaning equipment.
For More Details Circle No. 128—Page 269

GRINDING WHEELS: Acme Abrasive Co., 24200 Marmon, Centerline, Mich.—Catalog describes the company's plant and grinding wheels and offers price list of resinoid bonded type 1 straight wheels.
For More Details Circle No. 129—Page 269

ELECTRONIC RECORDER: Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne & Windrim Aves., Philadelphia 44—Instru-

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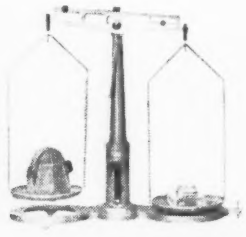

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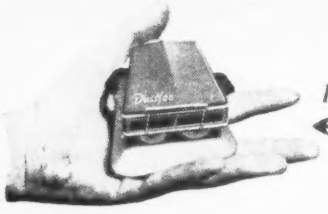

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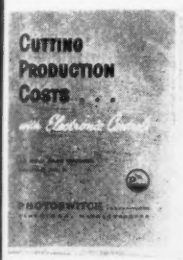
mentation data sheet 10.0-0-13 describes an electronic recorder that can cross an 11-in. chart in ½ second and measure the output of any primary device which is accompanied by or can be made to produce an emf of 3 millivolts or more direct current.

For More Details Circle No. 130—Page 269

LOOSE LEAF BINDERS: Remington Rand Inc., 315 Fourth Ave., New York 10—Booklet LL234 illustrates and describes over twenty loose leaf binders for sales and reference purposes. It describes technical advances and the advantages they made possible in new models.

For More Details Circle No. 131—Page 269

ELECTRONIC CONTROLS: Photoswitch Inc., 77 Broadway, Cambridge 42, Mass.



—New edition of "Cutting Production Costs with Electronic Controls" is a complete revision and contains 46 new case studies that explain how standard, packaged electronic controls have solved many industrial problems. The handbook is designed for the use of engineers, production executives and management personnel.

For More Details Circle No. 132—Page 269

LUBRICATORS: Manzel Division, Frontier Industries Inc., 315 Babcock St., Buffalo 10—Catalog 25G describes technical and operating features of high-pressure force feed lubricators designed for service at up to 30,000 lb. Dimensions and specifications information is included.

For More Details Circle No. 133—Page 269

FLOOR PATCHING: Master Builders Co., 7016 Euclid Ave., Cleveland 3—Pictorial directions show how to patch worn concrete floors quickly and easily through the use of iron-aggregate floor patches. Chart explains preparation of floor and application of patching material.

For More Details Circle No. 134—Page 269

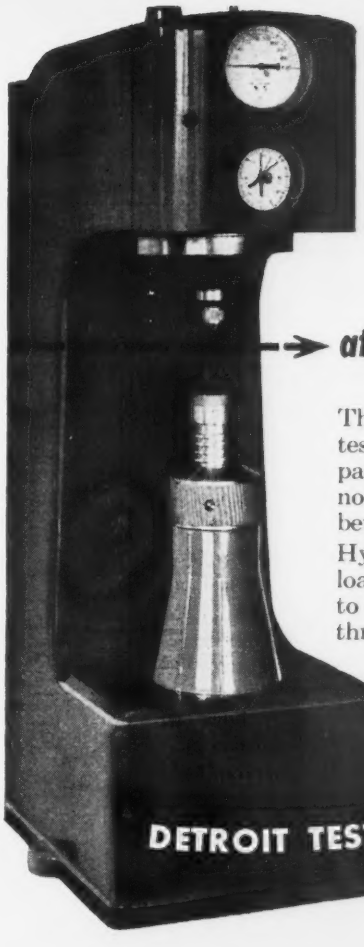
SIGNS: Ingram-Richardson Mfg. Co., Beaver Falls, Pa.—Bulletin CPI-653 concerns plant identification signs made of porcelain enamel. It offers photographs, data on advantages and information pertaining to facilities and services offered by the company.

For More Details Circle No. 135—Page 269

OVENS: Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15—Bulletin 53-CM includes a variety of data concerning core and mold ovens of all types and sizes. Typical installations are illustrated and described.

For More Details Circle No. 136—Page 269

AIR TOOLS: Rotor Tool Co., Cleveland 23—Booklet called "Keep 'em Cutting" presents a portable air



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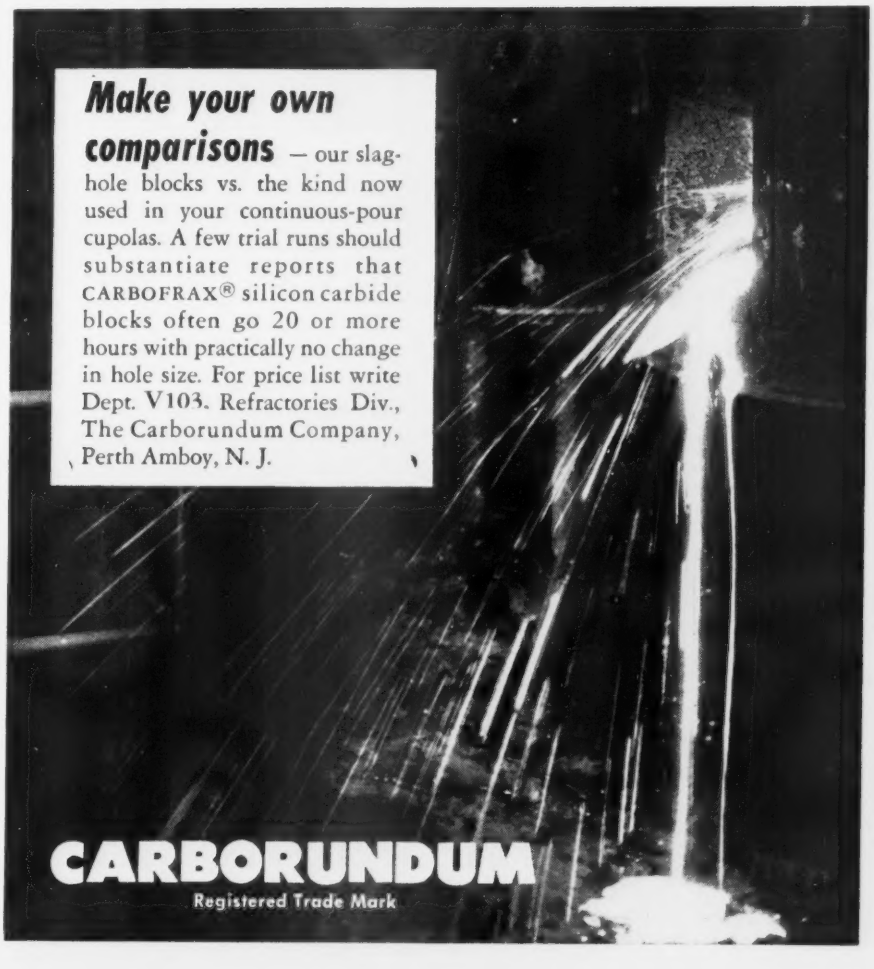

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For More Details Circle No. 137—Page 269

FLASK-LIFT MACHINES: Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35—Bulletin 531 includes complete specifications and capacities for jar flask-lift, plain squeeze flask-lift and jar squeeze flask-lift machines. Each is illustrated by photographs and diagrams.
For More Details Circle No. 138—Page 269

BELT CONVEYORS: Link-Belt Co., 307 North Michigan Ave., Chicago 1 — Book 2416 pictures and describes more than 500 belt conveyor idlers in 34 types. Items covered include light, medium and heavy duty 20-degree troughing idlers, two styles of 45-degree idlers; flat belt, belt training, rubber cushion and variable troughing idlers and others.

For More Details Circle No. 139—Page 269

FURNACES: Lee Wilson Contracting Co., 20005 West Lake Rd., Cleveland 16—Brochure is a photo portfolio of installations of gas, oil and electric furnaces for use in annealing, austempering, brazing, carburizing, forging, galvanizing, hardening, homogenizing, malleablizing, martempering, nitriding, normalizing, pearlitizing and other applications.
For More Details Circle No. 140—Page 269

OIL VALVES: Hauck Mfg. Co., 124-36 Tenth St., Brooklyn 15, N. Y. —Catalog 707A is devoted to oil valves and gives latest design features and capacities. It explains how the valves can help to avoid estimates based on guessing of the flow of oil to oil burners.
For More Details Circle No. 141—Page 269

SAWS AND KNIVES: Hanchett Mfg. Co., Big Rapids, Mich.—Catalog designed for saw and knife fitters is alphabetically indexed and divided into sections of equipment in related categories to assist in keeping saws and knives in shape to produce at capacity.
For More Details Circle No. 142—Page 269

SILICA CEMENT: Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh 22—Illustrated folder discusses uses and characteristics of a heat-setting refractory silica cement which corresponds in refractoriness and in chemical and physical properties to silica brick.
For More Details Circle No. 143—Page 269

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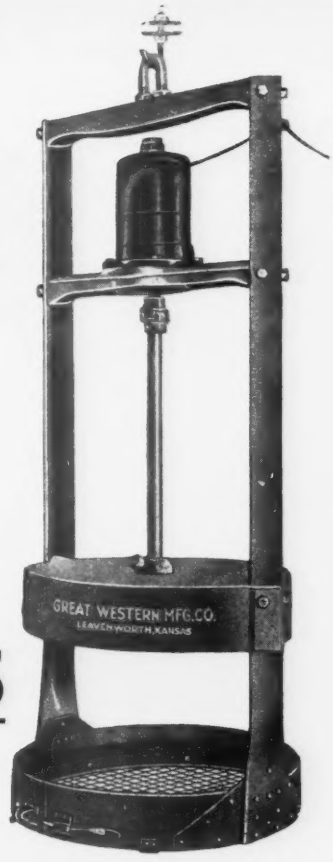

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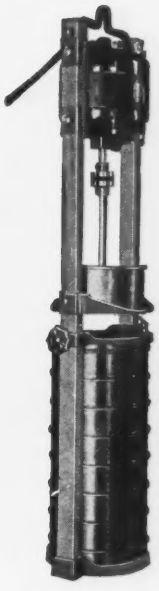

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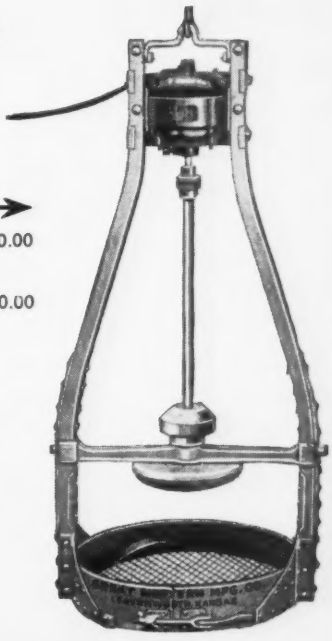

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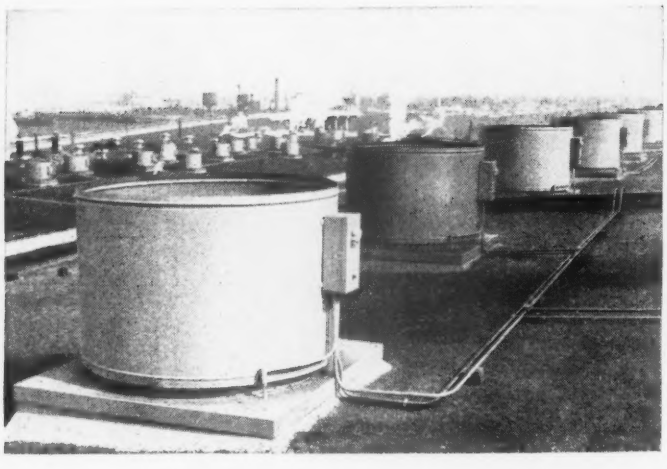

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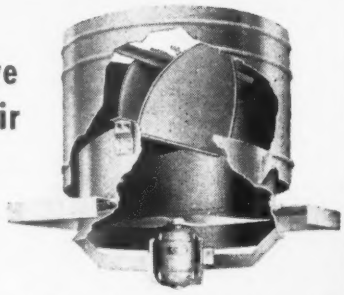

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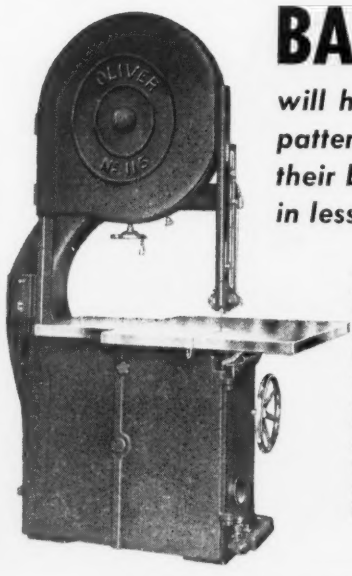

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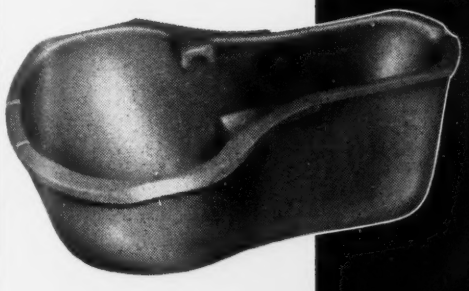

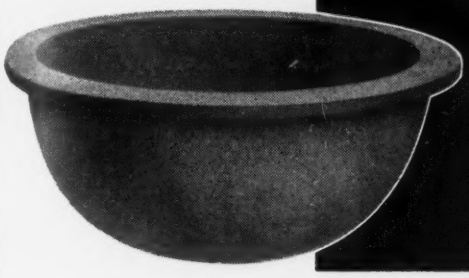

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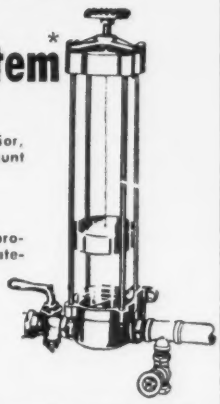

• FOR CORE SAND MIXTURES

AQUADYNE Wet Water produces a vastly superior, smoothly blended sand mix and reduces amount of core oil needed.

• FOR MOULDING OPERATIONS

AQUADYNE Wet Water spreads, diffuses and produces a faster penetration with moulding materials—resulting in sharper, cleaner castings and fewer rejections.

• FOR SAND CONDITIONING

Sand mixing is simpler, faster and more efficient. The Aquadyne System saves water, as well as time because its unusual low surface tension gives instantaneous coverage of each grain of sand it touches.

The HYDROBLENDER

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There's nothing better than AQUADYNE.

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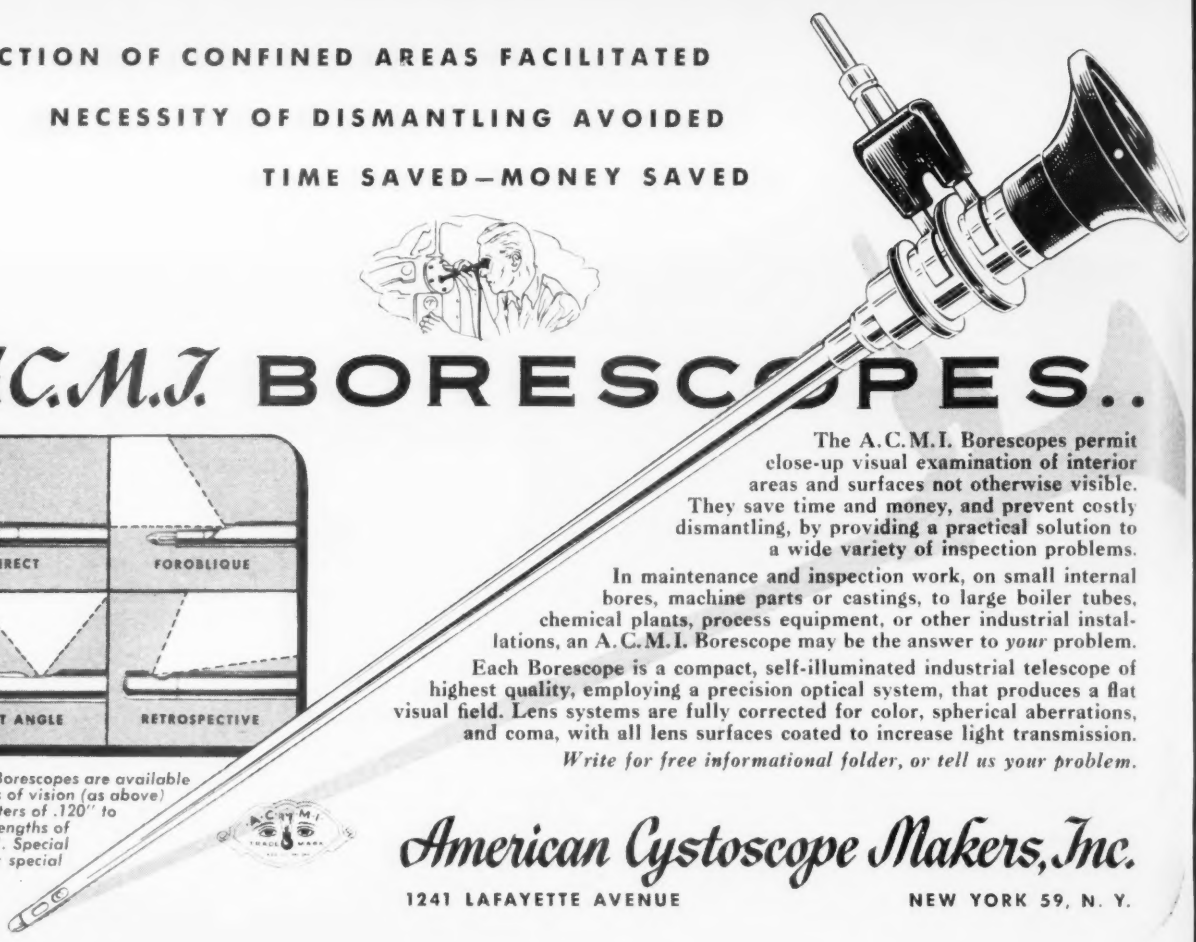
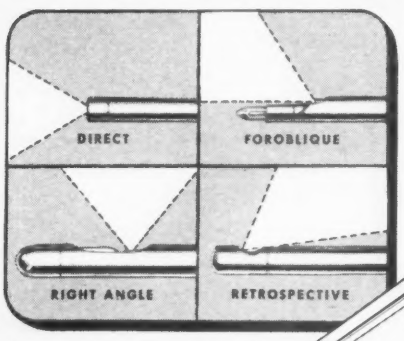


A.C.M.I. BORESCOPES..



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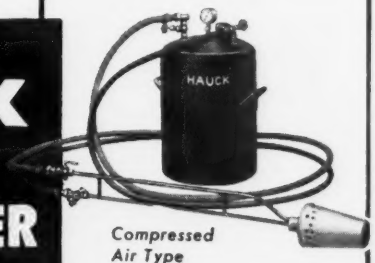
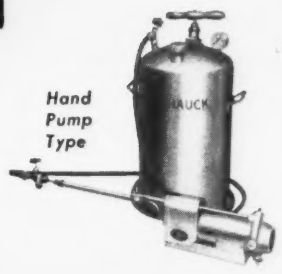


Compressed Air Type



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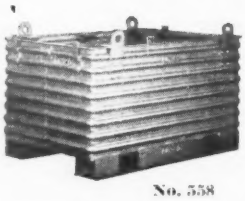
rugged BRUSCO handling equipment increases efficiency

BRUSCO CORRUGATED STEEL BOXES



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Save floor space — stack safely from floor to roof. Four way entry for fast, efficient handling. Equipped with crane lugs for movement by crane. Fabricated from heavy gauge corrugated steel to give added rigidity and maximum strength. Thoroughly and securely arc welded for longer, maintenance free life. Made in various sizes and load capacities to suit your requirements.

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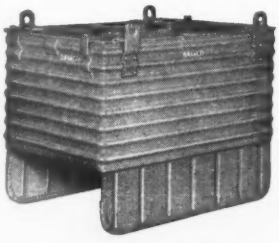
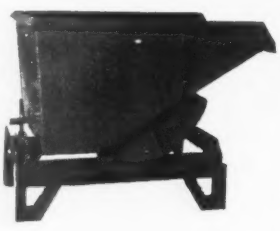


Saves valuable floor space and speeds production. Made in all sizes and various gauges of steel to fit any load capacity. Stack from floor to roof.

No. 1210 BRUSCO SELF DUMPING HOPPER



Speeds production and saves labor in handling your parts and materials. This hopper is fabricated of heavy steel plate thoroughly reinforced. Made in ½, 1, 1½ and 2 cubic yard capacities. Underclearance is optional.

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The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

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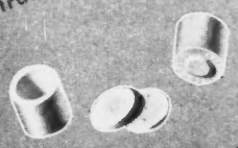

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TO YOUR SPECIFICATION

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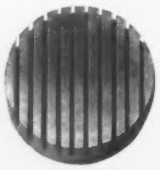
TYPE D
BRASS SLOTTED VENT — Head thickness .12", slot widths .010", .013", and .015". Use in curved core box surfaces.

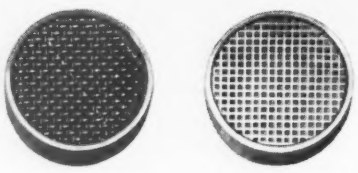
TYPE C
STEEL SLOTTED VENT — Thin head, chrome plated, use in flat surfaces of core boxes. Slot widths .010", .013" and .015".



DEMMLER

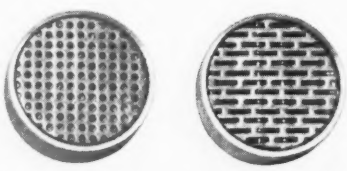
PRECISION CORE BOX VENTS

TYPE H
SCREEN VENT — Brass body with stainless steel wire mesh. Standard meshes No. 30, No. 40 and No. 50 available.



TYPE L
LECTROMESH VENT — Brass vent, head made of .010" thick Lectromesh sheet, with .022" square holes.

TYPE A
PERFORATED VENTS — Head of brass perforated sheet, .016" thick. Hole sizes: No. 00 (.020" dia.), No. 0 (.024" dia.) No. 1 (.027" dia.), No. 2 (.033" dia.)



TYPE B
PERFORATED VENTS — Staggered slots, .020" x .115", brass vent with head of brass perforated sheet.

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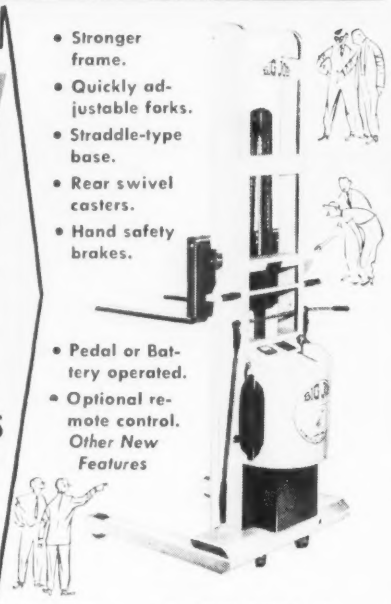

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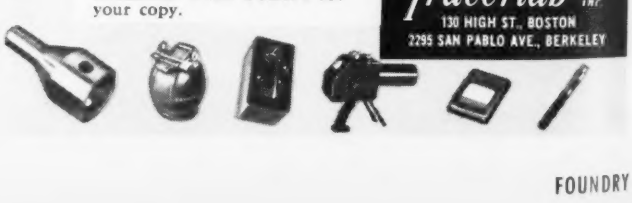

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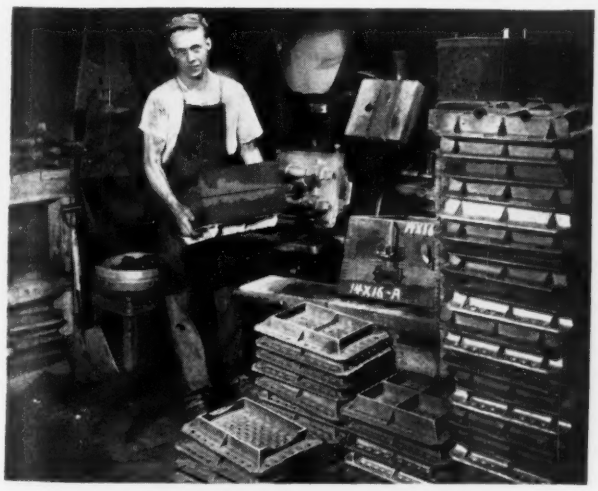

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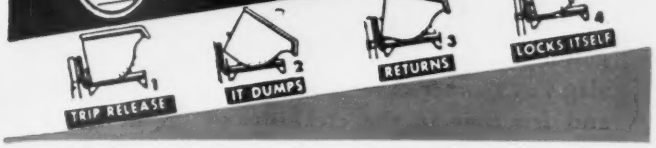

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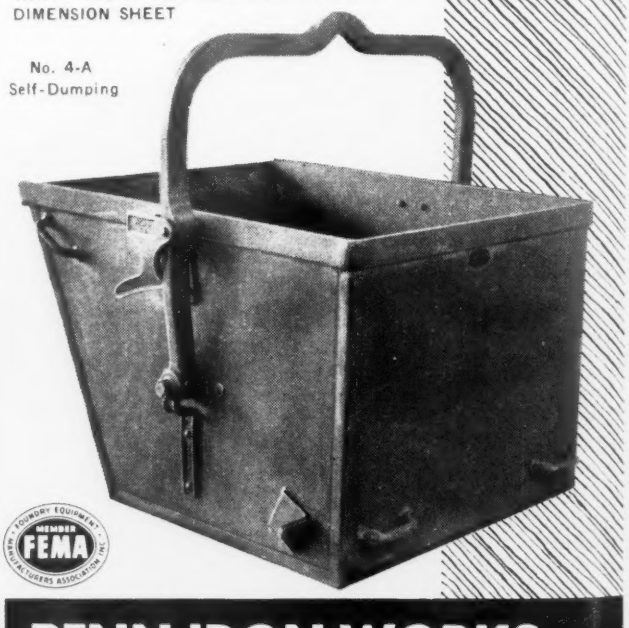

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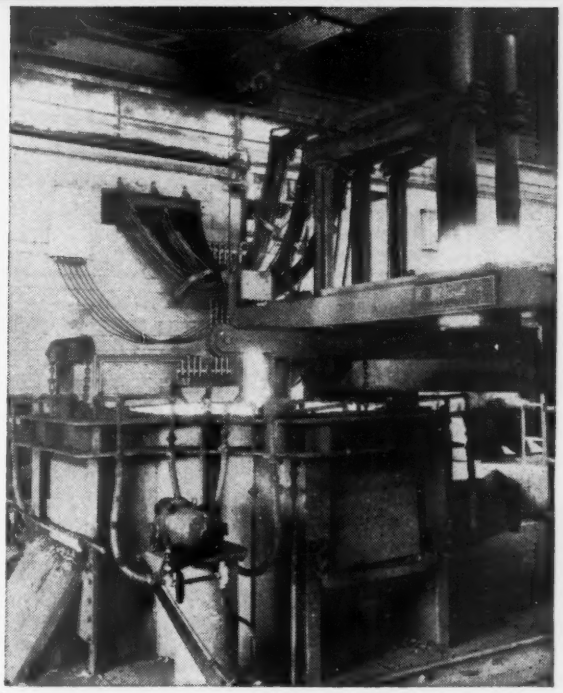

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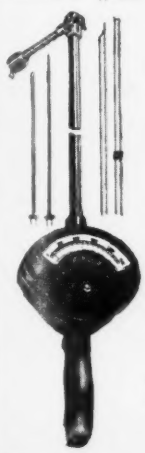

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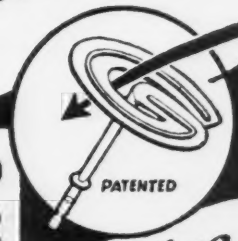

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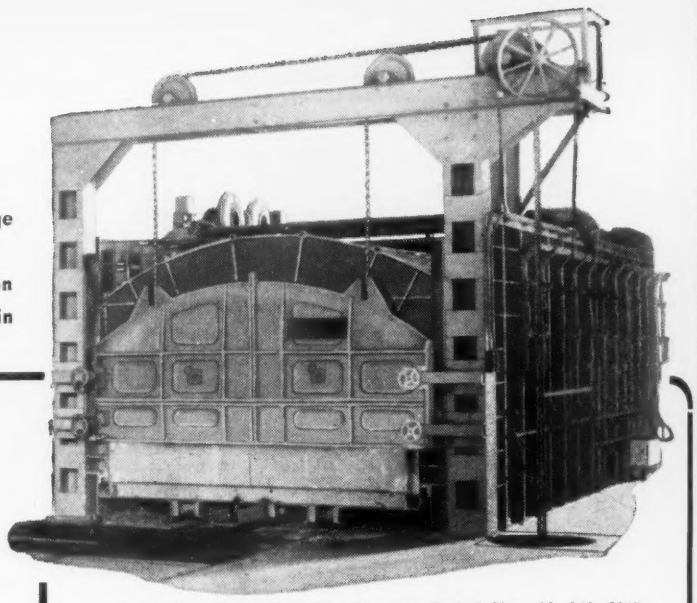

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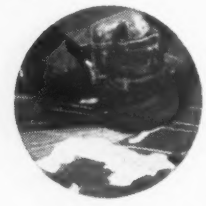

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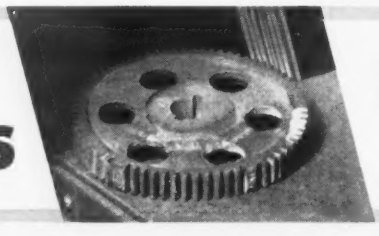

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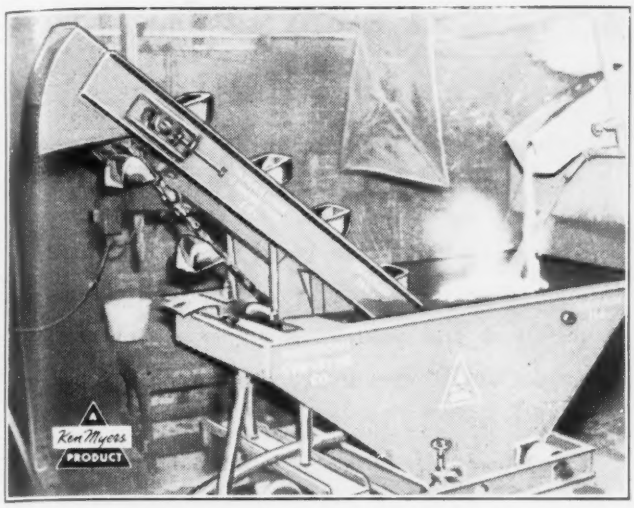

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These Four BLAW-KNOX *Buckets*

Help Solve Your Rehandling Problems for Average or Unusual Conditions

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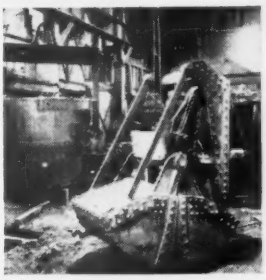

THERE is a type and size of Blaw-Knox Single-Line Hook-On Foundry Buckets to meet a wide range of operating conditions. Blaw-Knox can best give you the competent engineering service that makes possible selection of the bucket suited to your needs.

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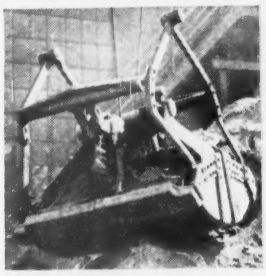

THIS Single-Line Hook-On Bucket solves rehandling problems when headroom is extremely limited. The ¾ yd. capacity bucket requires only 6'7" operating headroom. Also available in larger sizes.

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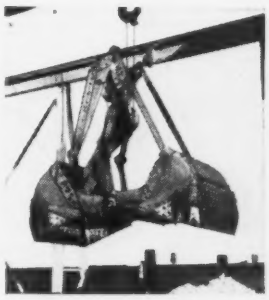
HERE'S the answer to the problem of handling coke and sand . . . simply by adding or removing liner plates, the *same* dual purpose Blaw-Knox Bucket handles both, with minimum degradation of coke and without sand leakage! The illustration at the upper right shows an open head type Single-Line Hook-On Bucket, rated 1 cubic yard, with liner plates applied inside of the shark teeth for handling sand, coal, small limestone and granular fines. Illustrated at the right is a closed head type 1 cubic yard Shark Tooth Bucket without liner plates for coke handling.

Blaw-Knox Shark Tooth Buckets are available in a wide range of sizes and for different headroom conditions.



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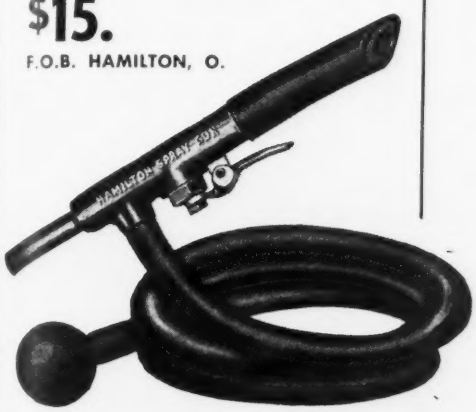

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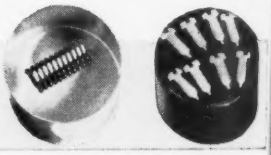

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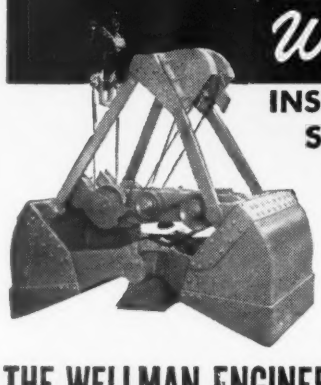

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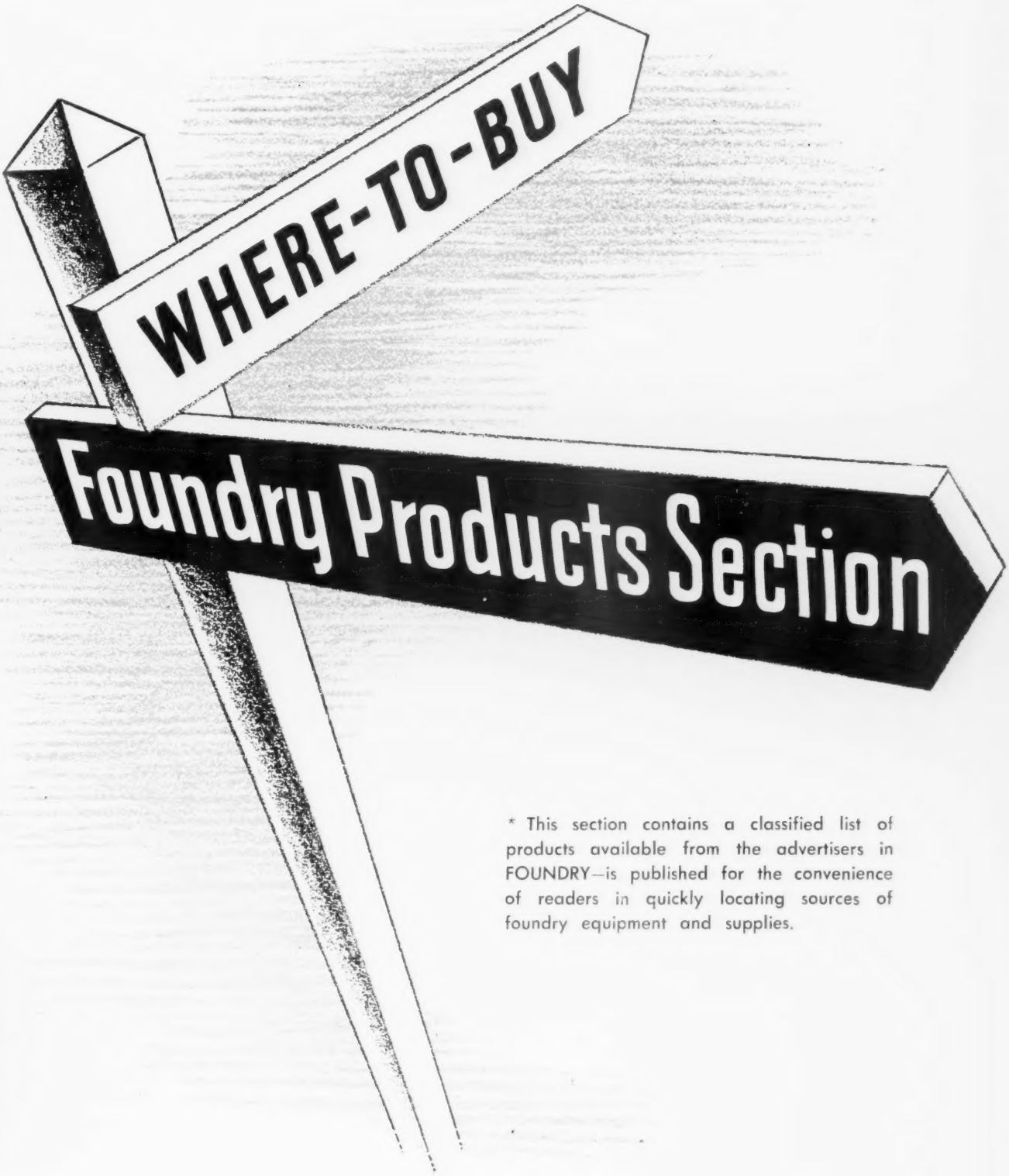

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The Bordon Co., Thor Division, 350 Madison Ave., New York 17, N. Y.
Durez Plastics & Chemicals Co., North Tonawanda, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.
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Marietta Concrete Corp., Marietta, Ohio.
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Stevens, Frederic B., Inc., Detroit 16, Mich.
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Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
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Johnston Mfg. Co., Minneapolis 13, Minn.
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Roots-Connersville Blower Div., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
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Ironton Fire Brick Co., Ironton, O.
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Pressed Steel Div., Republic Steel Corp., 6100 Truscon Ave., Cleveland, Ohio.
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Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.

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Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
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Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Despatch Oven Co., Minneapolis 14, Minn.
Drying Systems, Inc., 1800 W. Foster Ave., Chicago 40, Ill.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Girdler Corp., Thermex Division, 224 E. Broadway, Louisville 2, Ky.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Michigan Oven Co., 419 Brainard St., Detroit 1, Mich.
Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich.
W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.
J. O. Ross Engineering Corp., 444 Madison Ave., New York 17, N. Y.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Stroman Furnace & Engineering, Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

CORE PASTE

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Corn Products Refining Co., 17 Battery Pl., New York 4, N. Y.
Delta Oil Products Co., Milwaukee 9, Wis.
Eastern Clay Products, Dept. International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill.

CORE PASTE (Cont'd.)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundries Materials Co., Coldwater, Mich.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

CORE PLATES (Magnesium)

Christiansen Corp., 210 South Marion, Oak Park 1, Ill.

CORE PLATES (Steel, Asbestos)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Industrial Foundry Sales, 817 Hall St., Eaton Rapids, Mich.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Pressed Steel Div. Republic Steel Corp., 6100 Truscon Ave., Cleveland, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

CORE ROD STRAIGHTENING and CUTTING MACHINERY

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE SAND

American Silica Sand Co., Central Life Bldg., Ottawa, Ill.
Nugent Sand Co., Muskegon, Mich.
Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.
Pennsylvania Glass Sand Corp., 140 Stanwix St., Pittsburgh 22, Pa.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

CORE SAND MIXERS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Clearfield Machine Co., Clearfield, Pa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Mueller Machinery Co., Metuchen 1, N. J.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
The Patterson-Kelley Co. Inc., East Stroudsburg, Pa.
Posey Iron Works Inc., Lancaster, Pa.
Rover Foundry & Machine Co., Kingston, Pa.
Standard Sand & Machine Co., Blystone Div., 549 W. Washington Blvd., Chicago 6, Ill.

CORE SPRAYERS

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

CORE STRIPPERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE TRAYS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

CORE TRUCKS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Clark Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Prime Mover Co., Muscatine, Iowa.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

CORE VENTS

Demmler, Wm., & Bros., Kewanee, Ill.
Smillie, C. M. & Co., 1124 Woodward Heights Blvd., Ferndale 20, Mich.
United Compound Co., Inc., 611 Indian Church Rd., Buffalo 24, N. Y.

CORE WASH

Acheson Colloids Co., Port Huron, Mich.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Carborundum Co., Perth Amboy, N. J.
Cities Service Oil Co., 20 N. Wacker Dr., Chicago 6, Ill.
Corn Products Refining Co., 17 Battery Pl., New York City 4.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundries Materials Co., Coldwater, Mich.
Foundry Services, Inc., 280 Madison Avenue, New York 16 N. Y.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Mullite Refractories, Shelton, Conn.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Stevens, Frederic B., Inc., Detroit 26, Mich.
Titanium Alloy Mfg. Div. National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United Oil Co., Erie, Pa.
United States Graphite Co., Saginaw, Mich.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

CORE WIRES

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.
Viking Steel Co., 16700 St. Clair Ave., Cleveland 10, Ohio.

CORES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

CORES (Ceramic)

American Lava Corp., Chattanooga 5, Tenn.

CORES (Strainer) see STRAINER CORES

COUPLINGS (Air Line)

Cleco Division of Reed Roller Bit Co., Houston, Tex.
C. B. Hunt & Sons Inc., Salem, Ohio.
A. Schrader's Son 470 Vanderbilt Ave., Brooklyn 17, N. Y.

CRANE LUBRICATING SYSTEMS

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

CRANES (Bucket)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Electric Tramrail)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.

CRANES (Electric Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Erie Steel Construction Co., Erie, Pa.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.
Wright Hoist Div., American Chain & Cable Co., Inc., York, Pa.

CRANES (Gantry)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Wellman Engineering Co., 7000 Central Ave., Cleveland 4, Ohio.

CRANES (Hand Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, Ohio.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Jib)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Monorail)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES (Self-Propelled)

Baker Raulang Company, 1250 West 80th St., Cleveland 2, Ohio.
Hughes-Keenan Co., Delaware, Ohio.
Silent Hoist & Crane Co., 835 63rd St., Brooklyn 20, N. Y.

CRAYONS (Marking)

Markal Co., 3052 W. Carroll, Chicago 12, Ill.

CRUCIBLES

American Refractories and Crucible Corp., North Haven, Conn.
Bay State Crucible Co., Taunton, Mass.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., Pittsburgh, Pa.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

CRUCIBLE FURNACES

Ajax Electrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

CRUCIBLE POURING DEVICES

Modern Equipment Co., Port Washington, Wis.

CRUSHERS (Core)

Newaygo Engineering Co., Newaygo, Mich.
Simplicity Engineering Co., Durand, Mich.

CUPOLAS

Modern Equipment Co., Port Washington, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLAS (Hot Blast Equipment)

Whiting Corp., Harvey, Ill.

CUPOLA BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Roots-Connersville Blower Div., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CHARGING MACHINES

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CONTROL EQUIPMENT

Foxboro Company, Foxboro, Mass.

CUPOLA DUST ARRESTORS

Research Corp., Bound Brook, New Jersey.
Schneible Co., Claude B., 212 Stephenson Bldg., P. O. Box 81, North End Station, Detroit 2, Mich.
Whiting Corp., Harvey, Ill.

CUPOLA LIGHTERS

Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.
Hickman-Williams Co., Union Commerce Bldg., Cleveland 14, Ohio.
Whiting Corp., Harvey, Ill.

CUPOLA LININGS

Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., Amherst, Ohio.
A. P. Green Fire Brick Co., Mexico, Missouri.
Ironton Fire Brick Co., Ironton, O.
United States Graphite Co., Saginaw, Mich.
Walsh Refractories, 101 Ferry St., St. Louis 7, Mo.

CUPOLA PATCHING GUNS

Blastcrete Equipment Co., 11152 Santa Monica Blvd., Los Angeles 25, Calif.
Eastern Clay Products, Dept. International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill.

CUPOLA SPARK ARRESTORS

Research Corp., Bound Brook, New Jersey.
Claude B. Schneible Co., 212 Stephenson Bldg., P. O. Box 81, North End Station, Detroit 2, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUTOFF CORES

American Lava Corp., Chattanooga 5, Tenn.

CUTOFF MACHINES (Abrasive)

DoAll Co., Des Plaines, Ill.
Fox Grinders Inc., Oliver Bldg., Pittsburgh, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CUTTING OILS

E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

CYLINDERS (Air)

Bellows Company, Akron 10, Ohio.

DARK ROOM ACCESSORIES (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.
Picker X-Ray Corp., 25 S. Broadway, White Plains, N. Y.

DARK ROOM PROCESSING (Chemical Tanks, etc.)

Eastman Kodak Co., Rochester, N. Y.
Picker X-Ray Corp., 25 S. Broadway, White Plains, N. Y.

DEGASIFIERS

Foundry Services, Inc., 280 Madison Avenue, New York 16, N. Y.
Hooker Electrochemical Co., Buffalo Avenue & 47th St., Niagara Falls, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
National Pigment Co., Orthodox St. at Delaware River, Philadelphia 37, Pa.
Niagara Falls Smelting & Refining Div., Continental-Copper & Steel Industries, Inc., 2200-2214 Elmwood Ave., Buffalo 23, N. Y.

DEOXIDIZERS

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
National Pigment Co., Orthodox St. at Delaware River, Philadelphia 37, Pa.
Niagara Falls Smelting & Refining Div., Continental-Copper & Steel Industries, Inc., 2200-2214 Elmwood Ave., Buffalo 23, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

DEOXIDIZERS (Ferrous)

Carborundum Co., Perth Amboy, N. J.

DESULPHURIZERS

American Silica Sand Co., Central Life Bldg., Ottawa, Ill.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Columbia-Southern Chemical Corp., Div., Pittsburgh Plate Glass Co., Pittsburgh 19, Pa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 Mathieson Bldg., Baltimore 3, Md.
Modern Equipment Co., Port Washington, Wis.
National Pigment Co., Orthodox St. at Delaware River, Philadelphia 37, Pa.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Solvay Process Division Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DIE CASTING MACHINES

Kux Machine Co., 6725 North Ridge Ave., Chicago 26, Ill.

DOWEL PINS

Standard Horse Nail Corp., New Brighton, Pa.

DRILLS (Electric)

Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.
U. S. Electrical Tool Div., Emerson Electric Mfg. Co., 8100 Florissant Ave., St. Louis 21, Mo.

DRILLS (Pneumatic)

Gardner-Denver Co., Quincy, Ill.
Schramm Inc., West Chester, Pa.

DRUMS (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Homer Mfg. Co., Lima, Ohio.
Stearns Magnetic Mfg. Co., 635 S. 28th St., Milwaukee 46, Wis.

DUMP HOPPERS

Brummeler Steel Products Co., Grand Rapids, Mich.
Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

DUMP TRUCKS

Frank G. Hough Co., Libertyville, Ill.
Kwik-Mix Co., 3026 West Concordia, Milwaukee 16, Wis.
Prime Mover Co., Muscatine, Iowa.

DUST ARRESTING EQUIPMENT

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Dust Suppression & Engineering Co., Lake Orein, Michigan
Johnson March Corp., 1724 Chestnut St., Philadelphia 3, Pa.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Pangborn Corp., Hagerstown, Md.
Research Corp., Bound Brook, New Jersey.
Schneible Co., Claude B., 212 Stephenson Bldg., P. O. Box 81, North End Station, Detroit 2, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Air Filter Co., 266 Central Ave., Louisville 8, Ky.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland, O.
Dust Suppression & Engineering Co., Lake Orein, Michigan
Fly Ash Arrestor Corp., P.O. Box 1883, Birmingham 3, Ala.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Newcomb-Detroit Co., 5741 Russe St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Schneible Co., Claude B., 212 Stephenson Bldg., P. O. Box 81, North End Station, Detroit 2, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Whiting Corp., Harvey, Ill.

DUST CONTROL AGENTS

Aquadyne Corp., 441 Lexington Ave., New York 17, N. Y.

DUST RECOVERY SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Brady Conveyors Corp., 20 West Jackson Blvd., Chicago 4, Ill.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Pangborn Corp., Hagerstown, Md.

DYES & CHEMICALS

Eaton Chemical & Dyestuff Co., 1490 Franklin, Detroit, Mich.

ELECTRIC FURNACES (see Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.

ELECTRODES (Graphite and Amorphous) (Cont'd.)

International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS (Bucket)

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Brady Conveyors Corp., 20 West Jackson Blvd., Chicago 4, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
Jeffrey Mfg. Co., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Stephens-Adamson Mfg. Co., Aurora, Illinois.

ELEVATORS (Pneumatic, Material Handling)

Brady Conveyors Corp., 20 West Jackson Blvd., Chicago 4, Ill.
Fuller Co., Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)

Edwin S. Carman, 1643 Lee Road, Cleveland 18, Ohio.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
Harold E. Pridmore, Box 137, Palo Alto, Calif.
Westover Engineers, 3116 W. Fond du Lac Avenue, Milwaukee 10, Wis.
George N. Wileman, Commercial Trust Bldg., Philadelphia 2, Pa.

EXHAUST SYSTEMS

American Air Filter Co., Inc., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Pangborn Corporation, Hagerstown, Md.
Robbins & Myers Inc., Propellair Div., Springfield, Ohio.
Schneible Co., Claude B., 212 Stephenson Bldg., P. O. Box 81, North End Station, Detroit 2, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

FABRICATORS (Metal)

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Newaygo Engineering Co., Newaygo, Mich.
Penn Iron Works, Inc., Reading, Pa.
Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Acheson Colloids Co., Port Huron, Mich.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Stevens Inc., Frederic B., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Pangborn Corp., Hagerstown, Md.
Robbins & Myers Inc., Propellair Div., Springfield, Ohio.

FASTENERS (Conveyor Belt)

Flexible Steel Lacing Co., 4667 Lexington St., Chicago 44, Illinois.

FEEDERS (Belt)

Link Belt Company, 307 North Michigan Ave., Chicago 1, Ill.
Robins Conveyors, Div. Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

FEEDERS (Rotary)

Fuller Company, Catasauqua, Pa.
Great Western Mfg. Co., Leavenworth, Kansas.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Stephens-Adamson Mfg. Co., Aurora, Illinois.

FEEDERS (Vibrating)

Link Belt Company, 307 North Michigan Ave., Chicago 1, Ill.
Robins Conveyors, Div. Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

FERROBORON

Electro Metallurgical Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Cleveland, O.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp., of America, 420 Lexington Ave., New York, N. Y.

FERROCOLUMBIUM

Electro Metallurgical Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

FERROMANGANESE

Electro Metallurgical Div. Union Carbide & Carbon Corp. 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.

FERROMOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROSILICON

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Titanium Alloy Mfg. Div. National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILM (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FILLETS (Wood & Leather)

Canton Products, Canton 1, Ohio.

FIRE BRICK

Babcock & Wilcox Co., 161 E. 42nd St., New York 17, N. Y.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.
A. P. Green Fire Brick Co., Mexico, Missouri.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Mexico Refractories Co., Mexico, Mo.
Mullite Refractories, Shelton, Conn.
Norton Co., Worcester 6, Mass.
Stevens Inc., Frederic B., Detroit 16, Mich.
Walsh Refractories, 101 Ferry St., St. Louis 7, Mo.

FIRE CLAY

Cedar Heights Clay Co., Oak Hill, Ohio.
Eastern Clay Products, Dept. International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill.
A. P. Green Fire Brick Co., Mexico, Missouri.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., Amherst, Ohio.
Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.

FIRESTONE

Cleveland Quarries Co., Amherst, Ohio.
National Foundry Sand Co., 2970 W. Grand Blvd., Detroit 2, Mich.

FLASK BANDS

The Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASK BUSHINGS

The Adams Co., Dubuque, Iowa.
Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Hines Flask Co., 3431 W. 140 St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

FLASK PINS

The Adams Co., Dubuque, Iowa.
Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

FLASK PINS (Cont'd.)

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

FLASKS (Aluminum, Magnesium)

Adams Co., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASK FILLERS

Bartlett & Snow, C. O., Co. 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.
Industrial Foundry Sales, 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

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Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Industrial Foundry Sales, 817 Hall St., Eaton Rapids, Mich.
Pressed Steel Div., Republic Steel Corp., 6100 Truscon Ave., Cleveland, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

FLASK FITTINGS

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Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

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Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

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Ajax Electrothermic Corp., Trenton, N. J.
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Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
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Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., West Wilson St., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
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Mahr Manufacturing Co., Div. Diamond Iron Works Inc., Minneapolis 11, Minn.
Ohio Crankshaft Co., Tocco Division, 4620 E. 71st St., Cleveland 5, Ohio.
W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.

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Ajax Electrothermic Corp., Trenton, N. J.
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Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
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Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

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Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

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Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Reda Pump Co., Bartlesville, Oklahoma.
W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.
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Swindell-Dressler Corp., Pittsburgh, Pa.

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Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., Harvey, Ill.

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Roots-Connersville Blower Corp., Connersville, Ind.

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Willson Products Inc., Reading, Pa.

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U. S. Electrical Tool Div., Emerson Electric Mfg. Co., 8100 Florissant Ave., St. Louis 21, Mo.

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Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VISES (Hydraulic, Mechanical, etc.)

Desmond-Stephen Mfg. Co., Urbana, Ohio.

WASH ROOM EQUIPMENT

Bradley Washfountain Co., Box 732, Milwaukee 1, Wis.

WAX (Core, Vent, Pattern)

United Compound Co., Inc., 611 Indian Church Rd., Buffalo 24, N. Y.

WEDGES (Foundry)

The Adams Co., Dubuque, Iowa.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WELDING GAS

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING APPARATUS (Electric arc)

Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING and CUTTING APPARATUS and SUPPLIES

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)

National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
United States Graphite Co., Saginaw, Mich.

WELDING RODS & ELECTRODES

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Marquette Mfg. Co., 307 East Hennepin Ave., Minneapolis 13, Minn.
McKay Company, 1005 Liberty Avenue, Pittsburgh 22, Pa.

WETTING AGENTS

Aquadyne Corp., 441 Lexington Ave., New York 17, N. Y.

WHEELBARROWS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS, ABRASIVE (Cut-off)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Abrasives Corp., Vars Bldg., Buffalo 2, N. Y.
Macklin Company, Jackson, Mich.
Norton Company, Worcester 6, Mass.
Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Abrasive Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire Brush)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE BENDERS

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE CUTTERS

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE NAILS

Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

WIRE ROPE

Viking Steel Co., 16700 St. Clair Ave., Cleveland 10, Ohio.

WOODWORKING MACHINERY

DoAll Company, Des Plaines, Ill.
Oliver Machinery Co., Grand Rapids 2, Mich.

X-RAY EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Cystoscope Makers Inc., 129 East 78th St., New York, N. Y.
General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.
Picker X-Ray Corp., 25 S. Broadway, White Plains, N. Y.
Westinghouse Electric Corp., Gateway Center, Pittsburgh 22, Pa.

X-RAY FILMS

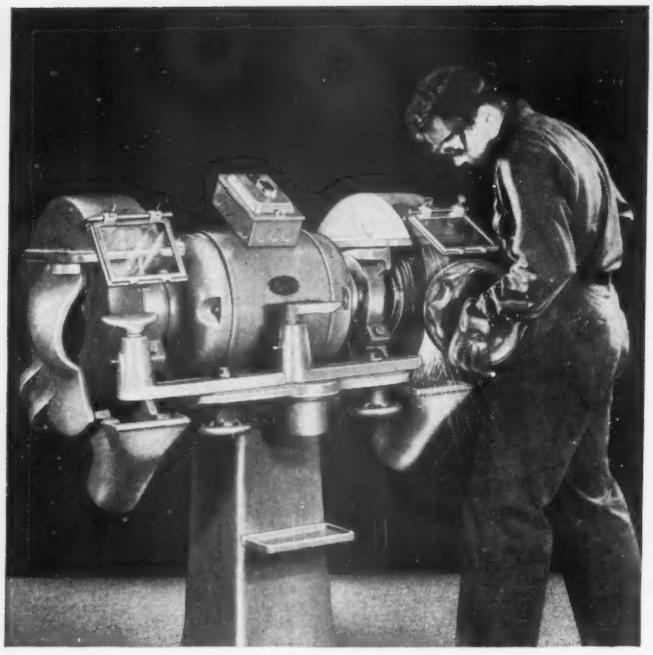
Eastman Kodak Co., Rochester, N. Y.
General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee 14, Wis.
Picker X-Ray Corp., 25 S. Broadway, White Plains, N. Y.

ZINC

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

ZIRCON SAND

Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.



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Standard equipment includes totally enclosed motor, 1 to 5 H.P., push button starter providing overload protection, ball bearings enclosed in dust-tight housings, enclosed adjustable wheel guards, tool tray and lift-out water pot. Eye shields and grinding wheels furnished as extra equipment. Furnished for 220/440 volt, 60 cycles, 2 or 3 phase AC.

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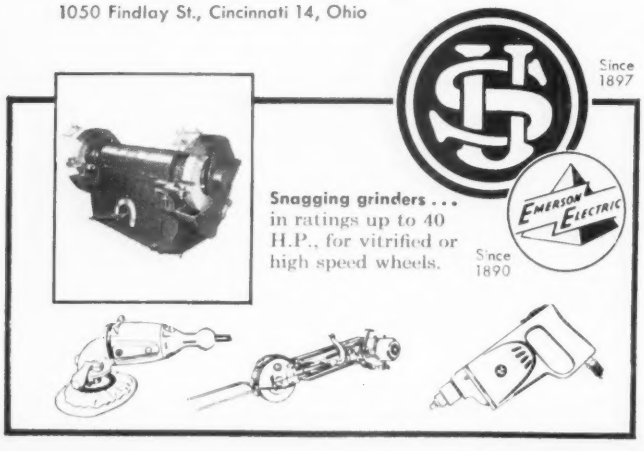
1050 Findlay St., Cincinnati 14, Ohio



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GLOSSARY OF FOUNDRY TERMS

Compiled by Ed Bremer, FOUNDRY Metallurgical Editor

This extensive glossary of foundry terms was compiled from a wide variety of sources. Arranged in handy booklet form, it is a valuable reference for every foundryman. *48 pages.*

$1.00

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133 pages, illustrated
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To help foundrymen minimize and eliminate defective castings. Thirty-one basic casting defects are listed and described. Defects are defined simply and completely, illustrated by 101 figures collected from foundries of the United States and Canada.

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CONSULTING AND SERVICE METALLURGIST

Must have technical background and malleable foundry experience.
Should have inclination and personality to work towards sales position and be prepared to travel. Write stating full details and salary expected.

BOX 729
FOUNDRY CLEVELAND 13, OHIO

PERMANENT MOLD SUPERINTENDENT

Excellent opportunity with large, modern Midwestern foundry having up-to-date equipment. Your experience should consist of permanent mold design or the operation of aluminum jobbing production. No other metal cast. Die design and gating knowledge essential. Promotional opportunities not limited. Attractive starting salary. Write stating age, experience, references and salary desired. Address: Box 762, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT ALUMINUM FOUNDRY

Position calls for experience in sand casting aluminum jobbing work. Superintendent must know pattern and core box equipment. Brass and bronze jobbing experience also would be helpful. Knowledge of mechanical and jobbing procedures in a nonferrous foundry preferred. This is an excellent opportunity in one of the nation's largest multiple-plant foundries, located in the Middlewest. Write, giving age, experience, references, education and salary desired. Replies confidential. Address: Box 761, FOUNDRY, Cleveland 13, Ohio.

WANTED CORE DEPARTMENT FOREMAN

For progressive foundry in Indiana. Must be capable of supervising core department for maximum efficiency and have knowledge for rigging equipment for blowing cores. Write, giving full details of personal background, experience and salary expected. Address: Box 763, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Opportunity for well qualified, experienced superintendent of nonferrous foundry employing 100-150 people. Applicant should be between 35-45. Enclose photograph and give complete record of education and experience in detail including previous employment and length of service. Address: Box 722, FOUNDRY, Cleveland 13, Ohio.

SUPERVISOR

Thoroughly experienced in high production mechanized jobbing foundry operation. Must have record of ability to handle men and thorough knowledge of modern equipment and methods. Established Eastern Foundry. State age, experience and salary. Address: Box 655, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

For cleaning room of a large steel foundry located in Western Pennsylvania. Must be experienced in the cleaning of miscellaneous and railroad castings for a production shop. Must be a good supervisor and be able to get production from the workers. Write giving places of previous employment, age and salary desired. Address: Box 798, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Wanted for gray iron foundry in New York State. Not mechanized. Experience in floor and machine molding and all phases of foundry operations. Advise age, experience and starting salary. Address: Box 799, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM FOREMAN

Experienced in steel foundry practice. In replying give complete information which will be held in strict confidence by a single executive. Address: Box 726, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

WANTED

General manager for captive gray iron foundry pouring six to eight tons of miscellaneous machine castings daily. Owner plans to build modern foundry to produce high tensile and ductile irons. This is an opportunity of advancement for the foundryman who understands latest cupola practice and sand control.

BOX 811
FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Unusual opportunity in medium size brass, aluminum and iron foundry in Southeast. Long-term expansion program requires superintendent with thorough knowledge of machine and floor molding, gating and setups for jobbing and production work. Applicant must know all phases of foundry work and be capable of producing pressure-tight and porous-free castings economically. Prefer applicant not over forty-five years of age. State qualifications and salary expected. Address: Box 796, FOUNDRY, Cleveland 13, Ohio.

STEEL CASTING AND GRAY IRON SALES ENGINEER

Young, aggressive metallurgically trained engineer, interested in sales development and customer contact work. Middlewest location. Please give educational training, experience and salary expected in first reply. Address: Box 801, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERINTENDENT

For completely mechanized Eastern foundry. Experienced in all phases of core blowing, sand control and establishing production standards. State age, experience and salary requirement. Address: Box 649, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

List past experience and also state salary expected in first letter. Must be familiar with foundry work. Address: Box 793, FOUNDRY, CLEVELAND 13, Ohio.

WANTED

Qualified and experienced steel foundry engineer for big concern in India situated at port. Salary according to merits. Apply airmail G.P.O. Box #586, Bombay 1, India, with copies of testimonials, stating minimum terms and joining time.

Positions Wanted

MANAGER—SUPERINTENDENT

Desire to relocate with a Southern foundry, ferrous or nonferrous. Can direct all phases of foundry activity. Set-up, train, and supervise all departments. Processing complete from print to casting, sand (all types), permold and shell. Top references. Address: Box 779, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Are you looking for an experienced man with years of experience in steel, gray iron, malleable, aluminum, sand and permanent mold? Well qualified to head your department and reduce your cost. Address: Box 795, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Available. Capable, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation and metallurgy. Fifteen years in present executive position. Middle aged. Good appearance. Pleasing personality. Address: Box 620, FOUNDRY, Cleveland 13, Ohio.

PRACTICAL FOUNDRYMAN

Thirty years' experience in gray iron, fifteen years in supervision, molding, melting, cleaning and cores. Know how to rig for production, gate and riser castings. I.C.S. Graduate. Good labor relations. Now employed. References. Address: Box 813, FOUNDRY, Cleveland 13, Ohio.

MANUFACTURERS' REPRESENTATIVE

Hard-hitting, experienced, thirty-five year old sales engineer, desires additional line. Contacting industrials past five years. Address: Box 800, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY MANAGER

Available about November 1st. Mature Executive (48 years). Experienced in all phases of foundry operations. Presently General Manager of automotive, gray iron foundry, employing 450 men. Excellent experience in labor relations, production problems and scrap control. Can produce outstanding "man-hour versus tonnage" production figures.

BOX 806
FOUNDRY CLEVELAND 13, OHIO

FOREMAN—WOOD PATTERNMAKING

Twenty years as foreman and department manager. Experienced in the machine tool and heavy mill industry. Also experienced in purchasing patterns and castings. Complete coordinating service. Iron and steel foundry background and connection. References and resume on request. Address: Box 775, FOUNDRY, Cleveland 13, Ohio.

PERMANENT MOLD DESIGNER AND FOUNDRYMAN

Experienced in all phases jobbing or high production. Position must involve responsibilities and opportunities. Address: Box 790, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Twenty-nine years experience in capacity of chemist, foreman of various departments, and during the past sixteen years have held position of plant superintendent in two different malleable foundries. Wide experience in all phases of foundry practice. Age 47. Address: Box 810, FOUNDRY, Cleveland 13, Ohio.

MANUFACTURERS' AGENT

Forming new company, additional lines wanted. Engineering background. Well acquainted State of Wisconsin. Consider on exclusive basis only. Address: Box 797, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Gray iron, 28 years' experience in production and jobbing, 10 years as a manager of plants with daily tonnages as high as 125 ton, employing up to 300. Man of unquestionable character and excellent ability. Know foundry thoroughly. Address: Box 661, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Superintendent or general foreman. Practical man. Twenty-seven years' experience in gray iron and nonfrrous jobbing and high production shops. Now employed. Address: Box 768, FOUNDRY, Cleveland 13, Ohio.

WEIGHT ESTIMATING

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Automatic calculator equipment. Nominal fee. Send blueprints to: **CHARLES E. ROLAND, ITASCA, ILLINOIS.**

FOUNDRY EXECUTIVE

Engineering graduate. Practical experience molding, core making, sand control, and cupola operations. Superintendent and assistant manager past 18 years; present position 15 years. Successful record in running floor, mechanized foundry, and machine shop, malleable, gray iron, and nonferrous metals. Forty-seven years of age. Address: Box 812, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

Twenty-five years' experience in all phases of steel foundry procedure, twelve years as foreman. Able to get along with men and try to reduce scrap. Age 43. Address: Box 786, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN OR FOREMAN

Practical man with nineteen years' supervision in nonferrous and gray iron including all phases of foundry operations. Jobbing and high production. Now available. Address: Box 803, FOUNDRY, Cleveland 13, Ohio.

Employment Service

EMPLOYMENT COUNSEL, INC.
"All The Name Implies"
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Recruiting men for employers in the foundry industry throughout the nation. Openings in Steel, Malleable, Gray Iron and Non-Ferrous—Jobbing and Production. Salaries to $20,000

PLANT MANAGERS	SUPERINTENDENTS
GENERAL FOREMEN	MOLD FOREMEN
CORE FOREMEN	MELTING FOREMEN
CLEANING FOREMEN	MAINTENANCE FOREMEN
PATTERN FOREMEN	METALLURGISTS
INDUSTRIAL ENGRS.	TIME STUDY ENGRS.

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$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: **JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.**

Representatives Wanted

FOUNDRY SALESMAN

Familiar with foundry equipment. To represent concern in Midwest with full line of used foundry equipment. Commission basis.

BOX 807
FOUNDRY CLEVELAND 13, OHIO

SALESMAN

Calling on foundries in Chicago territory to handle very profitable line. Wonderful repeat orders. Write complete qualifications and past experience selling foundries. Address: Box 792, FOUNDRY, Cleveland 13, Ohio.

SALESMAN

Graphite refractories to nonferrous foundries and steel mills New England and New York City; straight commission; experienced; practical background desirable; write giving full details and references. Address: Box 755, FOUNDRY, Cleveland 13, Ohio.

SALESMEN

Two to represent manufacturer of refractories. New York and Connecticut territory and Ohio territory. Refractory sales experience preferred or good acquaintance with foundry, steel and metallurgical trade. Give age, education, experience, salary expected. Address: Box 802, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

1—No. 2 Simpson Mill
1—No. 3 Simpson Mill
2—Osborn 712 Jolt Squeeze Pin Lift Molding Machines
3—Osborn 276 J Jolt Squeezers
2—SPO Jolt Squeezers Pin Lift Machines
ALL EQUIPMENT MUST BE IN GOOD CONDITION
MARCH-BROWNBACK CO., INC.
SOUTH & CHARLOTTE STS.
POTTSTOWN, PA.

MACHINERY WANTED

Induction Furnaces, Screens, Simpson Mixers, Riehle Compression Testing Machines, Pulverizers, Grinders, Conveyors. Address: **P.O. BOX 1351, CHURCH STREET STATION, NEW YORK 8, NEW YORK.**

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

Large Midwestern manufacturer is interested in purchasing for cash one used Pittsburgh Lectromelt Furnace in good operating condition. Will consider any of the following models of this furnace: "RT", "R", "ST" or "S".

BOX 804
FOUNDRY CLEVELAND 13, OHIO

VERTICAL TOWER
CORE OVEN

Approx. 12-feet high. Must be in good condition.

LYCOMING-SPENCER
DIVISION AVCO MANUFACTURING CORP.
ATTENTION: GLENN INMAN
WILLIAMSPORT 19, PA.

WANTED

Cleaning room equipment to clean heavy castings. Wheelabrator or Pangborn. Prefer car type room with rotating table, mounted on car capable of handling castings weighing up to 10 tons with all equipment necessary for automatic operation. Consider good equipment only. Please give lowest price.

THE J. B. EHRSAM & SONS MFG. CO.
ENTERPRISE, KANSAS

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SERVICES OFFERED

To the following: Presidents, Works Managers, Superintendents, General Foremen, Melters or Supervisors. Large companies or small; if you have difficulties in making gray iron, semi-steel, nodular or ductile malleable or steel; excessive burnouts in cupolas, air, annealing, electric, acid or basic, duplexing or triplexing, casting troubles, etc. All contacts held in strictest confidence. Will help you by sketches, drawings and written explanations for a very minimum rate. Address: P. O. Box 21, Bridgeport, Connecticut.

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Opportunity

ATTENTION FOUNDRYMEN

Have designed two new types of furnaces for making iron, complete control, cheaper than cupola operation, low sulphur .008 also can remove pinholes to a minimum. Seek capital to expedite this on a partnership basis. Address: P. O. Box 21, Bridgeport, Connecticut.

CAPITAL—EXPERIENCE

Metallurgist with good practical background interested in investing services plus capital in a small foundry, new or established. Prefer location in Pennsylvania, Western New York, or Eastern Ohio. Address: Box 805, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOR SALE

Iron and aluminum foundry located Ogdensburg, N. Y., on St. Lawrence River. Ready to operate. Fully modern steel and concrete foundry, office, shop and storage buildings. Ample yard space. Contact:

ST. LAWRENCE FOUNDRY & MACHINE CO.
90 BROAD STREET
NEW YORK 4, NEW YORK

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

FOUNDRY FOR SALE

Fully equipped jobbing and production gray iron foundry in Central Wisconsin with daily capacity up to 10 tons. $36,000 full price. Address: Box 740, FOUNDRY, Cleveland 13, Ohio.

SMALL FOUNDRY (NONFERROUS)

Complete. Two Knapp furnaces, 150 and 300 lb. alum. Sandblast cabinet, muller, core oven, compressor. All tools for semi and full permanent mold. Address: P.O. Box 241, Coronado, Calif.

FOR SALE

Brick and steel foundry, Southern Illinois, 160 x 320 feet, overhead monorail water transportation available. Ideal for mechanized operation, contains equipment. Address: Box 702, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Gray iron foundry in central Michigan specializing in boat anchors, City of Flint manhole castings, all kinds of furnace castings, State Roadside Park Gates, Board of Education boiler grates, and numerous other jobs. Orders guaranteed. Must sell because of ill health. Address: Box 809, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOR SALE
GRAY IRON FOUNDRY

Foundry equipped for bench squeezer, rollover and floor work for castings up to 2500 lbs. Whiting No. 4 cupola with Spencer Turbo Blower. Good core capacity, also Wheelabrator. Capacity 10-12 tons shipments daily, with room for extension of molding floor. Adjacent RR track. Serves all New England States.

BOX 785
FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE
CLEANING EQUIPMENT

1—Pangborn #45 type M Blast Room with collector.
1—27 x 36 Wheelabrator, rubber belt, skip hoist, dust collector.
1—15 x 21 Wheelabrator with rubber belt.
1—Cyclone dust collector, 10' diameter, 22" outlet, like new.

FURNACES

2—Baily 75 KW Electric Arc Furnaces, Tilting Side Electrodes with transformers.
1—Hausfeld Tilting Furnace, oil fired with blower, 150 crucible.
1—Ajax Induction Aluminum Furnace, 100# capacity, like new.
2—Hausfeld Magnesium Tilting Furnaces, 1200# capacity, lined.
7—Monarch #93 Barrel type furnace with blowers, 1000# alum, 3000# brass.
1—#8 Whiting Cupola with GE Turbo Blower and controls.

BLOWERS

2—Spencer Turbo Blowers, 40 HP motor, 3600 CFM at 24 oz.

SAND HANDLING EQUIPMENT

1—Tractor type sand slinger, 16" head, hyd. turning device, mag. separator.
1—Beardsley & Piper Tractor Sand Slinger.
1—Sandcutters, 48", 70", 76", and 80" cutting reels.

MOLDING MACHINES

2—International Jolt Strippers, type LP, #16-S.
1—Osborn 102 Bumper.
3—Davenport Jolt Strippers.
5—Osborn 142 Jolt Rollovers, 8" draw.
14—Osborn #275J Portable Cantilever jolt squeezers.
2—Osborn #405 Rollovers.
1—Osborn #243 Rollover.
3—Osborn #276PJ Stationary Jolt Squeezers.
3—International type "G", portable, 24" table, 10" draw.
1—Johnston & Jennings #918 Rollover Molding Machine.
1—Davenport 28A rollover, max. flask 36 x 60", 12" draw, 28 x 44" table.
3—Herman Rollovers, 2—40 x 60", 1—60 x 80" tables.
5—SPO 110J Jolt Squeezers.

LADLES

1—Modern Pouring Devices.
6—1000# Modern Cylindrical worm geared ladles.
2—4 ton Teapot worm geared ladles.
2—"U" type Modern worm geared reservoir ladles, 3000# cap. 34 x 60# I.D.
4—10 & 15 ton bottom pour steel ladles.

CORE BLOWERS

2—#1 Demmler, 1 Osborn #92.
1—CB 400, excellent condition.

OVENS

1—Porbeck #C-3C drawer type gas fired core oven.

AIR COMPRESSORS

1—40 HP Sullivan Air Compressor, model B-BIM #8, Serial #21661.

MISCELLANEOUS

1—DeWalt Cut-Off Saw, 10 HP, 3/60/220-440 Volt.
1—Truelift truck, Serial #29114, type 700, capacity 2000#.
1—Barrett Boring Mill, 27" swing, 7½ HP motor.
1—Howe Weighograph, 39 x 39", platform, 3000# capacity, electric.
We have 200 tons of cast steel, structural steel and sterling type floor flasks, excellent condition. Send for Complete List. Also Core Plates.

UNIVERSAL MACH. & EQUIP. CO.
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PHONE READING 71321—2—3
R. B. HARRISON, FDRY. MGR.
J. P. IRWIN, FDRY. ENGR.

For Sale

FOR SALE
MOLDING MACHINES

Herman Jar Rollover and Pattern Draw Molding Machine—New in Nov. 1944; 48 x 144"—10,000# Series Rollover Serial No. 1812; solid cylinder jolt machine Ser. No. 4167; read discharge roller conveyor complete; No. 4 (1½") Electro Pneumatic Timing Device 115 volts, 60 cycles; 2 sets 6000# Pneumatic Flask Clamps complete with special holders (In like new condition) ..... OFFER
Herman Jar Rollover and Pattern Draw Molding Machine—80" cap. 6000# Series $1500.00
International JDP Pattern Draw machine; 600# cap.; 8" draw; on wheels. Jolt-pin lift..$475.00
#2047 Osborn Jolt Rollover Pattern Draw molding machines—1943 ..... $275.00
#601-13 Osborn Jolt Rollover Pattern Draw.. ..... $350.00
#405 Osborn Rollover molding machine—79" $1000.00
#413-3 Osborn Jolt Rollover Pattern Draw molding machine; 130" x 42" $6500.00
Osborn #275J Jolt Squeezers $125.00
SPO Model 914 Jolt Rollover $250.00
SPO #2136-1 Jolt Squeeze Strip..... $700.00
#1 Johnston & Jennings Jolt Squeeze Strip molding machine $175.00
#918 Johnston & Jennings Jolt Rollover Pattern Draw molding machine $1500.00

CORE BLOWERS

#91 Osborns for small cores..... $750.00
#193-4 Osborns for medium cores $1500.00
#94 Osborns for large cores $2500.00

FURNACES

20 Ton Lectromelt furnace.....OFFER
Stroman Aluminum Furnace—reverberatory type; 120 lb. cap. gas fired; with skip hoist and hydraulic tilting equqipment $3000.00

FORK LIFT TRUCKS

6000 lb. Clarks—Fork Lifts .... Each $1250.00
15,000 lb. Hyster Fork Lifts $4500.00

SANDSLINGERS

Beardsley & Piper Tractor Type Sandslinger with magnetic tower—13' arm $7500.00

WHEELABRATORS

20 x 27 American Wheelabrator $1750.00
27 x 36 American Wheelabrator ... $2500.00

MISCELLANEOUS

#404 Clearfield Mixer $1000.00
Handy Sandy Model HS 7 GT—complete unit with 4 hoppers and conveyor $3500.00
Marschke Swing Frame Grinder—10 HP..$650.00
Marschke Double End Grinder—7½ HP..$375.00
Beardsley & Piper Screenerator $350.00
#6 Whiting Cupola Blower $450.00
50 HP Ingersoll Rand Air Compressor...OFFER

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BALCHER MACHINERY COMPANY
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TELEPHONE: FAIRMOUNT 1-1186

SURPLUS EQUIPMENT

B & P Tractor Type Sandslinger Model 531B, Track width 11'; Head 16"; 3/60/220..$2500.00
Holding or Melting Furnace—Eclipse Fuel Eng. Co. Model 4AL; 250# capacity (never used) $200.00
4—#104 Milw. Jolt Squeeze Molding Machines 17" x 21" table, 18" shut height..each $125.00
Miscellaneous Hines aluminum popoff flasks and jackets—like new—write for sizes.

L. J. MUELLER FURNACE CO.
2005 W. OKLAHOMA AVENUE
MILWAUKEE 15, WISCONSIN

PNEUMATIC TOOLS FOR SALE

(4) Chicago Pneumatic air rammers. (4) Chipping hammers. (2) Small hand grinders. Most of these tools have never been used. Address: Box 808, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EQUIPMENT
MOLDING EQUIPMENT

Herman Jolt Rollover #6000, 40" x 60", 1947
2—Herman Jolt Stripper, 48" x 54", 1947
Osborn Jolt Roll Over, model 405S, with Roll out Car 44" x 48"
2—275 J Osborns—late type
1—75J Osborn
6—SPO Squeezers 110J
29—2047-4 Osborns Jolt & Draw
1—558 Osborn Pin Lift
5—Haynes Squeezers
2—Adams 12 x 38 Squeezers
1—Milwaukee Squeezer
1—#332 Osborn Jolt Rollover
2—Int'l. Portable 24 x 30 Rollover
2—Tabor 31 x 40 Rollovers

SAND HANDLING EQUIPMENT

Unit A Syntron Feeder Hopper, 6' x 6'
2—Aerator, Overshot type, 9' x 2' & 4' x 3'
Aetna Sperser System
Simplicity Shaker, model C
Belt Conveyor Systems
Simplicity Gyrating Screen 2' x 3'
4—Green Sand Hoppers 4 yd. cap.

CRANES & HOISTS

15—Curtis Traveling Bridges, 15' span
16—Curtis Air Hoist, 5 & 6" Cylinders, 3½' x 4' Lifts
Electrified Monorail

CUPOLA & LADLE EQUIPMENT

1—Whiting Blower 3900 CFM at 20 oz.
Roots Connersville Blower, 22 x 66, 75 hp
#7½ Roots Connersville Blower 13,000 cfm
North American Centrifugal Blower, 3000 cfm
#5 Whiting Cupola & Charger
2—#9 Whiting Cupolas
Geared Ladles—1 ton to 4 ton—tilt.

MISC. FOUNDRY EQUPT.

1—Schramm 25 hp Air Compressor
10,000 ft. #458 Chain Conveyor with Trolleys
Brinell-Rockwell-Richie Testers
2—Int'l SB11 Core Blowers
Demmler #1 Core Blower
3—12 x 12 Pangborn Sand Blast Rooms, with Dust Collectors
2—Lindberg Fisher 225 lb. tilting Furnaces & Blowers
1—400# Detroit Electric Furnace
2—6000# Automatic Transporters.
Baker Lift Truck, 6000# cap., 1948
Yale Lo Lift, Redi power
300 ft. 10" Logan Roller Conveyor 3½" Dia.
Logan Wood Slat Conveyor, motorized, 36" x 35' Roller Conveyor
15—Double End Grinders
#124 Gardner 53 Horiz. Grinder
1—U. S. Double End Grinder—Late
1—Standard Buffer & Polisher
Tons of Flasks 12 x 18 to 48 x 120
Core Blower, Champion, model CB400, 300 lb.
Roto-Clone units, 24W & 36W, with sludge ejectors
2—48 x 72 Jeffrey Vibrator Feeders
Vibrators, Osborn, 1⅝" x 2"
Welded Steel Pouring Crucibles, new, 1700#
1—McLeod Tumbling Barrel
4—Whiting 30 x 60 Tumbling Barrels—late
2—Sand Cutters Model M
1—B & P Mulbaro
Bottom Dump, Sand Buggies
Exhaust Fans—to 60"
Fire Extinguishers—CO2
Exhaust Blowers—all sizes

WE WILL BUY—FROM 1 PIECE UP TO ENTIRE FOUNDRY

GREENE BROTHERS
(FORMERLY ASSOCIATED WITH ALLIED MATERIALS HANDLING CO.)
511 FREEMAN AVE.
CINCINNATI 3, OHIO

HAVE YOU EVER NOTICED the numerous types of headings under which classified ads are listed? Whether interested in obtaining qualified personnel, selling used machinery, wanting to buy equipment, or are yourself looking for a better position, you should seriously consider advertising in the classified section of FOUNDRY MAGAZINE.

●

FOUNDRY has 45,000 readers which cover the entire foundry industry. That means that for a nominal sum you get the widest possible coverage of the industry and your advertisement reaches "just the right people".

●

The Classified Staff is equipped to handle all details in the placement of your ad.

CLASSIFIED ADVERTISING DEPT.
FOUNDRY
CLEVELAND 13, OHIO

For Sale | For Sale

SPECIAL LISTING!!

JUST PURCHASED

EQUIPMENT OF THE RYBOLT HEATER CO.

ASHLAND, OHIO

Fully equipped foundry, cleaning room, pattern shop and maintenance machine shop.

To be sold from premises. Everything must go by Nov. 1, 1953

1—Complete Jeffrey overhead sand handling system. Includes 2 #610 Clearfield Mullers, shakeouts, conveyors, elevators, etc. 12 Steel hoppers, structural steel supports.
Rollover and Pattern Draw Molding Machines, Herman, Davenport, Tabor.
Jolt and strip Molding Machines, Herman, Davenport, Spo.
Jolt, squeeze and strip Molding Machines, Osborn, Spo.
Portable Jolt Squeeze Molding Machines, Osborn, Spo.
Roller conveyor, 10" to 36" wide, heavy duty, approx. 2500 ft. (above rail).
Core Room completely equipped, 3 core ovens, core blowers, etc.
Cupola and Ladle Equipment, No. 5 and No. 3½ Modern, Piqua Blower, Mixing ladles, 1000# geared tilting bull ladles, 350# Modern Pouring ladles, etc.
Cranes and Hoists: 40' overhead bridge crane 3 ton cap. cab operated, 20' hand travelling crane.
3—12' hand travelling cranes, 1—30" hand travelling crane,
6 Louden Monorail systems, air hoists, electric hoists.
Air Compressors: 100 H.P. 13" x 14" Worthington, 50 H.P. 12" x 12" Gardner-Denver, with receiving tanks.
Cleaning Room: 8' Wheelabrator Tablast, Sly Blast Room with turntable, tumbling barrels, double end grinders, Pneumatic grinders.
Pattern Shop: completely equipped with bandsaws, cutoff sawtable, jointer, planer, floor drills, wood lathe, etc.
Machine Shop: 7'6" x 48" Bickford vertical boring mill, 18" x 10' engine lathe, 4' radial drill, tool grinder, drill presses, power hacksaw, monorail system, air hoists, etc.

FOR THE BEST VALUES WATCH FOR OUR FUTURE LISTINGS

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC RD. GL. 1-1222—GL. 1-1538 CLEVELAND 10, OHIO

FOR INSPECTION CALL REPRESENTATIVE AT ASHLAND, OHIO, 41596

FOR SALE

Jolt Squeeze Machines in good operating condition. Priced for quick sale.
8 Milwaukees
8 Arcades
5 Osborns
WRITE:
C. T. JONES, PLANT ENGINEER
GUNITE FOUNDRIES CORPORATION
302 PEOPLES AVENUE
ROCKFORD, ILLINOIS

FOR SALE

One No. 217-13E Milwaukee Jolt Squeeze Rollover Draw Molding Machine. This machine has never been used and is on the original skids just as received from the factory.

REASONABLY PRICED.
NEW HAVEN FOUNDRY
NEW HAVEN, MICHIGAN

FOR SALE

1—International Type PK Jolt Squeeze-Pin Lift—18" Cylinder, 8" Lift.

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO.
2052 LINCOLN PARK WEST
CHICAGO 14, ILLINOIS
LINCOLN 9-6121

SAND MULLER FOR SALE

5A Baker-Perkins used 1½ years since new. Taken out of operation July 29. Complete with 125 HP motor, starter, and speed reducer. Force feed oil pump to all bearings. To be sold at 60% of new price or any fair offer. Contact: **DAYTON-PORTSMOUTH FOUNDRY CO., PORTSMOUTH, OHIO, or THE DAYTON STEEL FOUNDRY CO., DAYTON, OHIO.**

FOR SALE

1—Type F International Jolt Rollover Air Draw Molding Machine with 31 x 54" table, 16" draw, 2500 lb. capacity. Equipped with air flask clamps and automatic leveling bars. Good operating condition. Address: J. F. QUEST FOUNDRY CO., 900 SOUTH 4TH ST., MINNEAPOLIS 15, MINN.

FOR SALE

Milwaukee Jolt Rollover Draw Molding Machines. New 1944. 12" draw, 1200# and 1500# capacity. Address: **GARDEN STATE MACHINERY CORPORATION, 59 EDISON PLACE, NEWARK 2, NEW JERSEY.**

FOR SALE

MOLDING MACHINES

2—No. 275 Osborn jolt squeezers.
2—Deuscher Stationary jolt squeeze.
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers.
4—#610 Johnston & Jennings Air Jolt Rollover Draw Portable 24 x 30 table.
1—Tabor 36 x 50 table Air Jolt Rollover Draw, 3000# capacity.
2—International PKL 14"-5½" Jolt Squeeze Pin Lift.
1—Tabor Pedestal Core Rollover Hand Ram Rollover Draw 14 x 20 table 8" draw.

BLOWERS FOR CUPOLAS AND FURNACES

2—15 HP Spencer-Turbine 2250 CFM at 16 oz.
10—High temperature blowers 1400° F. 9000 to 15000 C.F.M.
2—#7½ Roots rotary blowers—27 x 81—1400 CFM.
1—Connersville rotary blower 22 x 66 45 cu. ft. per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—5 HP 20-oz. Spencer Turbine Blowers.
2—2 HP 20-oz. Spencer Turbine Blowers.

METAL MELTING EQUIPMENT

1—1000# open flame brass melting furnaces gas fired.
1—Hausfeld Stationary Brass, Multiple gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al Cap.
1—Hausfeld 2000# aluminum capacity furnace barrel type, open flame, oil fired.
New 32" to 41" dia. shell cupolas made to order.
New 1000 lb. aluminum cap. tilting crucible furnaces to specifications.

MISCELLANEOUS

1—Beardsley & Piper Motive Sandslinger on rails, 19" head, 14' 6" swing, 3/60/220.
1—Simplicity Model B Sand Conditioning Unit 4' x 8' double deck screens with aerator for piling.
1—Beardsley & Piper Screenarator, Model M 3/60/220.
1—Stoney crane type shakeout.
1—NC-4 Royer sand separator.
1—#1 Demmler core blower.
2—#16 Roto-clone units complete.
1—McLeod Small Sand Blast Barrel 24 x 24.
1—36W Wet Type Roto-Clone 34000 CFM.
1—24W Wet Type Roto-Clone 13000 CFM.
Complete stock of rebuilt mill and dust exhaust blowers.
1—27 x 36 American wheelabrator, tumblast with rubber belt.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

CLASSIFIED ADVERTISING

For Sale

FOR SALE

WE OFFER FOR SALE THE FOLLOWING USED EQUIPMENT—

1—Used Size 16 x 30 Roots-Connersville Rotary Blower, serial #14691, rated to deliver 3300 CFM (sea level) when running at 358 RPM against 4 lb. pressure, displacement; 10.55 CFR, less motor. Works No. 3362. Approx. weight 10300# cast iron. Location—Bldg. #54 Steel Foundry.

1—Used 2-Ton Whiting Side Blow Steel Converter, serial #120, Shell Dia. 5'-0" provided with Foxboro Control, serial #C-99149 less motor, with reversing drum controller and resistor, also Cleveland Worm Reducer, size 300-AH, serial #1AA64582, 3.7 HP, 325 RPM, 52-1 ratio. One spare shell complete with trunnions and gear, less nose and Whiting "Junior" Electronic control, serial #127 with Whiting Amplifier unit complete with tubes, adj. resistor eye selector switch and cabinet and Esterline-Angus Strip chart recorder for recording flame luminosity and Photocell Unit complete with bracket. Works No. 3360. Approx. weight 13700# Steel. Location Bldg. #54 Steel Foundry.

1—5 H.P. Star Electric Brake Motor, 220/440 Volts, 3 Ph., 60 cy., 1050 RPM, Type MHB254 with gear drive and drum hoist.

(TO BE SOLD AS IS.)

WORTHINGTON CORPORATION
PURCHASING DEPARTMENT
HARRISON, N. J.

FOR SALE

Motors, Generators, Transformers from 1 HP to 2500 HP

World headquarters for T.E.F.C. and explosion proof motors.

World's largest inventory.

ELECTRIC EQUIPMENT CO.
ROCHESTER, N. Y.

For Sale

FOR SALE
TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
4500	16 oz.	G.E.	660	20 oz.	A-B
3500	40 oz.	Spencer	500	10 oz.	No.Am.
2800	1 oz.	Spencer	400	16 oz.	Spencer
2700	16 oz.	No.Am.	400	4.3 oz.	Spencer
2700	16 oz.	Spencer	340	20 oz.	A-B
2500	7 oz.	Sturt.	320	12 oz.	Spencer
2000	2½ oz.	Spencer	225	16 oz.	Spencer
2000	1 oz.	Spencer	180	15 oz.	Spencer
1150	20 oz.	No.Am.	9100	7" SP	Sturt.
800	8 oz.	No.Am.	1100	4½" SP	Bayley
675	16 oz.	No.Am.	100	7" SP	Spencer

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

No. 9 Whiting Cupola. Shell diameter 84 inches, over-all height 71 feet. Erected. Complete with spark arrestor, new lining support and new tuyere casting to accommodate lining for 60-inch diameter. Used but in excellent condition.

CONTACT: A. E. HAMILTON
YORK-GILLESPIE MANUFACTURING COMPANY
39th STREET & ALLEGHENY VALLEY R.R.
PITTSBURGH 1, PA.
PHONE: MUSEUM 1-9737

FOR SALE

Clearfield #920 Mixer, excellent condition, Serial 205-C. Complete with motor and starter. Address: **WM. P. LAYTHAM & SONS COMPANY, 925 MARKET STREET, PATERSON, NEW JERSEY.**

FOR SALE

Two inch and four inch soil pipe machines and flasks. Seventy-five popular filling patterns, snap and binders, rattler, core machine and arbors. Other soil pipe machines. A real bargain. Address: **2008 PORTLAND AVENUE, SHREVEPORT, LA.**

For Sale

TESTING MACHINES

1—Riehle 400,000# hydraulic and beam type Compression Testing Machine
1—Riehle 200,000# Universal
2—Riehle 100,000# Universal
1—T. Olson 100,000#
Also Simpson Sand Mixers 18" dia. Laboratory, #0, #1, #1½, #2, #3
Miscellaneous: Screens, Pulverizers, Grinders, Conveyors—all types, Tyler Rotap Screens, etc.
OUR 36th YEAR

CONSOLIDATED PRODUCTS CO., INC.
13-20 PARK ROW NEW YORK 38, N. Y.
TELEPHONE: BARCLAY 7-0600

FOR SALE

1—Beardsley & Piper Model S Sand Conditioner
4—Haynes 10" Jolt Squeezers
1—Royer Sand Blender, NC 2
1—Rightway Pedestal Grinder

BOX 794
FOUNDRY CLEVELAND 13, OHIO

MELTING EQUIPMENT

Stroman 800 pound capacity iron and nonferrous melting furnace. Type 4" SK-oil fired, air tilt—Excellent condition.

VERMONT EVAPORATOR CO.
OGDENSBURG, N. Y.

LIQUIDATION

New Equipment Never Installed

TO BE SOLD AT 40% TO 50% DISCOUNT

LOCATED AT ADSCO — North Tonawanda, N. Y.

EQUIPMENT INCLUDES:

2—B & P Mulbaros
1—500# DETROIT Furnace
1—WHITING 6VSD Skipcharger
5—#110 SPO Jolt Squeeze
1—REDDY SANDY
1—TABOR 7½ HP Cutoff
2—FOX 3A Grinders
1—FARQUHAR Car Unloader
1—167' x 24" Trough Conveyor
1—#242W Osborn Jolt Rollover
1—#3070 Jolt Stripper
1—CH-2 Dust Collector
1—Pouring Bridge Runway with Bridges, Pouring Devices & Ladles

Sand Testing Equipment—Misc. Moulding Machines—Cupola & Blower—Hines Flasks & Jackets—Core Oven—Oil Conversion Unit—Roller Conveyor

CALL COLLECT IF INTERESTED

LAND-WHITEHEAD EQUIPMENT CORP.

P.O. Box 939 **(PH: 54379)** **Reading, Pa.**

For Sale

MUST SELL

SAND BLAST EQUIPMENT

48 x 48 Wheelabrator Tumblast, a beauty

48 x 42 Wheelabrator Tumblast, several to choose from.

Pangborn 10 ft. Multi-table blast, good condition.

Any reasonable offer for one or all of the above will be accepted, as cash and space are needed.

Dealers invited.

DIAMOND SAND BLAST, INC.
5654 WEST JEFFERSON
DETROIT 9, MICHIGAN

FOR SALE

DETROIT ELECTRIC FURNACE

Type AA of 1,200 lb. cold metal or 2,600 lb. hot metal capacity, complete with mechanical and electrical equipment for melting and rocking, including oil filled transformer of 11,000 v. primary and 125 v. secondary. Presently crated but available for inspection on 48 hours notice. Ideal for high test cast irons, brasses or bronzes. Price: $9,500.00. Address: **HOPE ELECTRICAL PRODUCTS CO., 338 WILSON AVENUE, NEWARK 5, N. J.**

For Sale

FOR SALE

Osborn Molding Machine, jolt rollover pattern draw, pit type, pneumatic drive, draw flask 64", Model 405-1 ..... $1500.00
#30 Tabor Hydraulic jolt rollover pattern draw molding machine, 30" x 41" table, 12" draw $1200.00
Osborn 2047-4 Jolt Rollover, table 18" x 24", 8½" draw $350.00
25-Tabor Pneumatic Molding Machines, 10" squeeze ..... $125.00 ea.
Osborn Molding Machine, portable #74..$105.00
Adams Portable Hand Squeeze Machine, 13".. ..... $60.00
Wheelabrator Table #2, with 8-24" Multitables $2750.00
Pangborn 1 GF Barrel, capacity 150 lbs..$250.00
Jeffrey Sanditioner, capacity 10-15 tons per hour $400.00
Pangborn EN 2 Cabinet $200.00
Sandblasting Room, gravity feed, 7' x 13'..... ..... $450.00

M. ELSTEIN
370 EAST HOUSTON STREET
NEW YORK 2, NEW YORK

FOR SALE

1—Milwaukee Jolt Rollover, Model No. 60-B-4, Serial No. 12471, Table size 30" x 60". Machine used only six months. Available for immediate delivery. Wire, Phone or Write:

SOUTHERN CAR & MFG. CO.
400—7th ST. SO. BIRMINGHAM, ALABAMA
TEL: 4-1714

For Sale

FOR SALE

1—Used Pittsburgh Lectromelt Furnace Type C-16
Side Charge 1½ ton per hour melting capacity
Complete with 800 KVA Transformer

BAY CITY ELECTRIC STEEL CASTING CO.
BAY CITY, MICHIGAN

FOR SALE

Wire Straightener and Cutter, Lewis Machine Co. Serial No. 7 D 131, capacity 1/16 to 3/16", equipped with 220-440 Volt Motor and Moslo Reel. Address: **WISCONSIN GREY IRON FOUNDRY CO., 2569 NORTH CAMBRIDGE AVENUE, MILWAUKEE 11, WISCONSIN.**

FOR SALE

First quality aluminum patterns for 1" medium soil pipe fittings. Also complete set of aluminum patterns for waterless aluminum utensils. Address: **ST. JEROME INDUSTRIES LTD., CASTONGUAY ST. WEST, ST. JEROME (TERREBONNE) QUE., CANADA, TEL: 3767.**

ANNOUNCING OPENING OF NEW WAREHOUSE AND SHOP IN CHICAGO!

PRICES ON ALL FOUNDRY EQUIPMENT CUT BEFORE MOVING!

FOR SALE

AIR COMPRESSOR
Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 HP, 3/60/220/1200 rpm motor, 350 CFM at 100#.

BLOWERS
Spencer Turbo Blower 2250 CFM @ 16 oz., 15 HP, 220/440 V motor. New 1946.
Ingersoll Rand SF24.
Buffalo 7E, 3500 CFM @ 32 Oz. 50 HP 220-440 V/3535 rpm motor.

CONVERTER
100 KW Rotary Westinghouse 220 V 60 cycle primary 250 V DC, complete with controller and panel.

CORE BLOWER
Demmler #3E Dropaway Draw, New 1946

CRANES
5 Ton P & H Overhead Elec. Traveling Crane, 30'6" span, 15' lift (can be increased) 3 motor, 220 V A.C. New 1946.
5 Ton P & H Overhead Electric 20'5" span, electric hoist, hand travel both ways, P/B control 440 V A.C.
10 Ton Northern Overhead Elec. Traveling Crane, double girder, fish belly, 3 motors, 230 V D.C., 54'7½" wide C to C of wheels can be cut down to fit smaller size.

CRUSHERS—PULVERIZERS
2—Stedman 15" x 12" Type A. One with 10 HP 220-440 V motor. One without motor.
7—Prater Blue Streak Pulverizers, 30 HP motor.

ELECTRIC FURNACES
Detroit 200# Type LF 100 KW with transformer for 440 V primary.
Detroit 350# Type LFA 230 KVA transformer 13,200 primary volts.

FIRE EXTINGUISHERS
Stregis Model 181 Dry Powder for magnesium fires.
Buffalo 50 gal. soda-acid cart type.

GRINDERS
Fox 10 HP 3/60/220 V Swing Frame.
U. S. 15 HP, 3/60/440 V Swing Frame.
Hammond 7½ HP, Type W.H. High Speed, 2" x 20" wheel.
McCabe High Speed Double End, 2" x 24" wheels.
Ransom S B Double End 2" x 20".
Fox 15 HP Swing Frame.
2—Hammond 20 WR-2, 3" x 24" wheel, 20 HP motor.

HOISTS
500# American LoHed.
1000# Cleveland 220/440 V.
1000# Detroit 220/440 V.
5—1000# P & H Hevi Duty with trolley.
2—2000# P & H Hevi Duty with trolley.
2000# Detroit Electric.
2000# American LoHed.
11—4000# P & H Hevi Duty with trolley.
2—4000# P & H Hevi Duty with trolley and powered drive unit for moving hot metal.

LADLE
3 Ton Whiting geared ladle. Like new.
5 Ton Whiting Mixing Ladle on wheels.

MOLDING MACHINES
1—Champion Pin Lift Pushoff, 44" x 44" x 12".
2—Champion Pin Lift Pushoffs, 46" x 46" x 12".
1—Champion Jolt Squeeze Strip Molding Machine, column type, 12" jolt cylinder 8" lift, 18" x 21" table.
1—Champion 24 Hand Clamp rollover 26" x 16" table.
1—Herman 20" x 30" Rollover Pattern draw 6" bumper.
1—Herman 4000# High Speed Rollover 30" x 60" with 32" x 48" bumper, 13" cylinder pattern device.
2—Herman 20" x 24" Jolt Rollover Pattern Draw, Like New.
1—Osborn 601-13 Portable Jolt Rollover Pattern Draw, 30" x 24" flask size, 10" draw, 900# cap.
1—Molding Unit, consisting of Osborn 23" x 24" table, Jolt squeeze and Osborne 17" x 24" 814P Rollover with overhead hopper for each machine, 1 with bottom dump, other with flat belt sand delivery.
1—Tabor, 1000# Rollover 30" x 5', Excellent condition.
2—International Type G.
Davenport Jolt Rollover Pattern Draw Portable
2—Milwaukee 165 Jolt Squeeze Strippers, late type, excellent condition.

MULLERS
Simpson #1.
Simpson #2, bucket loader, motor on base plate.
Simpson #3, motor on base plate.
Simpson #3, Type H.
Clearfield #404, 5 HP 440 V motor.
Kwick Mix Paddle type portable.
Royer Jr. Sand Separator and Blender

ROD STRAIGHTENER
Pneumatic Guillotine Type.

ROTOCLONE
Size 24, Serial 9747 with chain type ejector, 40 HP, 3/60/220 V motor.

ROTOBLAST
Pangborn, table with 3-8" rotating work tables, 3 position loading, cleaning and touch-up designed for work similar in size to aircraft cylinders. Like New condition.

SHAKEOUTS
1—3' x 5' Link Belt.
2—4' x 6' Simplicity

SLINGER
B & P Motive Type, 19", two speed head, 25 HP, Perma Magnet, bucket elevator to load tank, storage bin with conveyor to elevator.

SPEED REDUCERS
Cleveland 40S-R1, 36 to 1, 20.5 HP
Falk Motoreducers 7½ HP.
U. S. Syncrogear Motors 7½ HP
U. S. Syncrogear Motors 5 HP

ACME EQUIPMENT CO., INC.

WE WILL BUY FOR CASH A SINGLE PIECE OF EQUIPMENT OR YOUR ENTIRE FOUNDRY.

126 South Clinton Street Phone: Andover 3-3430 Chicago 6, Illinois

OUR PHONES ARE BUSY—THANKS TO YOU!

. . . and we don't mind a bit! Your calls have been coming in at a terrific rate . . .and we've been just as busy locating new sources of equipment. That's the way we build our inventory to serve you better. Each month you'll find additional equipment listed in this ad—check it over *carefully*—then call us.

A. A. A. MACHINERY & EQUIPMENT CO.

MOLDING MACHINES

10—**OSBORN** #559 HD Jolt Strippers, stationary, Table 25" x 30", Jolt 1200 lbs. cap.
1—Osborn #333 H Jolt, Squeeze, Power Rollover, Pattern Draw, 2000 lbs., Jolt, 22" x 44" Table Jolt Cylinder 12", Draw 22", Squeeze Cylinder 18".
2—Osborn #36 Core Draw Machines.
2—Osborn #332 Jolt, Squeeze, Rollover, Pattern Draw, Draw 9", Flask Size 25" x 36".
1—Osborn #816 Jolt Squeeze Stripper, Squeeze Cylinder 16", Jolt Cap. 1000 lbs.
6—Osborn #2047 Jolt Rollovers, 8½", Draw, Flask Size 22" x 16" x 10½" deep. 600 lbs. cap.
5—Osborn #275 J Jolt Squeeze Molding Machines.
4—Osborn Model #814-P, Jolt, Squeeze, strippers.
5—Osborn #601-13, Jolt, Rollover, Pattern Draw, 600 lbs. cap., Flask Length 30".
2—Osborn #405, Jolt, Rollover, & Pattern Draw, Flask Size, 64" x 57", Jolt Cap. 3000 lbs.
5—Osborns #2047-4, Jolt, Rollover, Pattern Draw, Flask Size 22" x 16" x 10", 8½ Draw, 600 lbs. Jolt Cap., Power Rollover.
*2—Osborn #331 Jolt Rollover, Squeeze and Pattern Draw, Squeeze cylinder Diameter 13", Table Length 30".
*5—Osborn Jolt Squeezers #75J, Serial #6277Y.
*2—**JOHNSTON & JENNINGS** Model 918, Jolt Rollover and Pattern Draw, Table Size 44" x 54, 20" Draw.
1—Johnston & Jennings Jolt Squeeze Molding Machine, Serial Number 20873194.
*2—Johnston & Jennings #815, Jolt Rollover and Pattern Draw, Table 30" x 40", Pattern Draw 15", Cap. 1200 lbs.
*1—Johnston & Jennings Stationary Jolt Bin Lift Machine, Model 1216S, Table Size 36" x 54", Pattern Draw 16", Cap. 3000 lbs. Maximum Flask Size 48" x 60", Jolt Cylinder Dia. 12", Draw Cylinder 6".
*1—Johnston & Jennings Stationary Jolt Pin Lift Machine, Model 812S, Table Size 30" x 38", Pattern Draw 12", Capacity 1600 lbs. Maximum Flask Size 36" x 42", Jolt Cylinder Dia. 8", Draw Cylinder Dia. 5".
*3—**INTERNATIONAL** Model PKL, Jolt, Squeeze, Air Pin Lift Machines, 18" x 24" Table, Lift 5½", Squeeze Cylinder, 12".
1—International Pushoff Stripper, 42" x 26" table, 6" Draw.
5—International Type "R" Hand Ram, Hand Turnover, Foot Draw Machines.
*2—International Type "RJ" Jolt Ram, Hand Turnover, Foot or Hand Lever Draw Machines, Various Sizes.
*3—International Type JFL, Jolt Ram, Foot Lever, Pin Lift, Various Sizes.
*4—International Type G, Air Jolt, Air Turnover Foot Draw Machine, 20" x 8".
*1—International Type G, Air Jolt, Air Turnover Foot Draw Machine, 30" x 8".
*1—International Type LJSD—14, Jolt Squeezer —Double Squeeze Head, 16" x 20" table.
*1—International Type F, Jolt Rollover Air Draw Molding Machine, 31" x 54" table 16" draw, 2500 lbs. cap., with air flask clamps, automatic leveling bars.
*2—**DAVENPORT** Model SA-34, Jolt Rollover, and Pattern Draw, 2500# Jolt Cap., 15" Draw, 34" x 48" Table, Flask Max. 36" x 54".
*2—Davenport Model SA-28, Jolt Rollover, and Pattern Draw, 1500# Jolt Cap., 12" Draw, 30" x 40" Table.
*2—**TABOR** Jolt Rollover and Pattern Draw, Draw 10", 600 lbs. Cap. 22" x 42". Portable.
1—Tabor Jolt Rollover and Pattern Draw 25" x 30".
*1—Tabor Jolt Rollover Pattern Draw, 30" x 40" Table, Draw 12", cap. 1000 lbs., Maximum length of pattern 53", minimum length of pattern 20", height of flask 20½". Portable.
3—**MILWAUKEE** Model 123-13, Jolt, Squeeze, Machines, 12" cylinder, 17" x 26" table.
3—**CHAMPIONS** Pushoff Strippers, 42" x 26" table, 6" Draw, Serial #5413, 5415, 5416.
*1—Champion Jolt Squeezer, Portable, Size JS-16-P. Serial #5770, Table Size 18" x 21".
*1—Champion Power Jolt, Hand Turnover, Foot Draw Machine, 13" x 17" table, Model #JM 16, Serial #5092.
*1—**HERMAN** Rollover, Jolt, Pattern Draw, 6000 lbs. Table Size 42" x 90".

GRINDING EQUIPMENT

1—Beasley Double End Grinder, Stand, 30" wheel with work rests, 15 H.P. motor.
1—U. S. Electric Double End Stand Grinder Model 65 VS, Snagging type.
1—Hammond Model WR—1 Double End Grinder, Snagging, 7½ H.P. 220/440, 60 cycle, 3 phase, 1943 Machine.
2—Hammond Model WH—10 Double End Grinders with (2) 7½ H.P. 220/440 V. Motors, Wheel Size 20" x 2" x 2", Serial #7239, 7240.
2—U. S. Electric Model 20 Double End Grinders, 5 H.P. 220/440 V., Wheel size 20" x 3" x 2".
1—Queen City Model 100 Double End Disc Grinder with 10 H.P. 220/440 Volt Motor, Size 20" x 2" x 2". Very Late Machine.
4—Mummert Dixon Swing Grinders, 10 H.P. 220/440 Volt Motor, Model #2016, 20 x 3 x 10 Wheels.

SAND EQUIPMENT

2—Beardsley-Piper Model "S" Screenarator, portable, Pneumatic tires.
2—Royers #2, Sand Conditioners, Portable, 15 Tons Per Hour.
*1—Royer #NDP Sand Conditioner, Portable, 25 Tons Per Hour.
2—Royers #NDS 42, Sand Conditioners, Stationary, 25 Tons Per Hour.
1—Jeffrey Type "P" Sand Conditioner, Class B Mixer, Portable Type, Serial #377.
1—American Sand Cutter, Model AM, Size 69 x 45, 1945 Machine.
2—American Type AA Sand Cutters.
1—Beardsley & Piper Model M Creenerator.
1—Newage Ready Sand Simplicity—Magnetic sererator, mounted on rubber, Like New.
1—Molders Friend Sand Conditioner with watering device, extra brush 60" wide.
1—Combs Gyrating Riddle 21".

MELTING FURNACES

2—Fisher Melting Furnaces, Model MNP, Gas Fires, Nose Pouring, 1700 lbs. Capacity Aluminum, Electric Tilting.
1—Holding Furnace, 300 lbs. Cap.
*1—Hausfield, Tilting Furnace, 500 lbs. Cap. Nose Pouring.
1—Baily Electric Arc Furnace, used on brass, tilter using square electrodes, on side transformer 75 KVA Serial #173, type C, single phase, 60 cycle, HT Voltage, 4700-2300, Low Voltage 30-75, Brown electronic unit.

HEAT TREAT FURNACES

1—Eclipse Gas Fired Furnace, 4 burners, 18" x 20" x 60" inside dimensions, with motors and blower, 1944 Machine.
1—American Gas Furnace Model DC, 10" x 16" x 26" inside dimensions, 1600 degrees to 2350 degrees F.

MULLERS

1—Simpson #2 Sand Muller. Complete with motor & drive. Open Gear Type.
*1—Simpson #3 Sand Muller, Open Gear Type.
2—Beardsley & Piper #70 Speed Mullers.
1—Beardsley & Piper Motive Type Sand Slinger, 22" x 4" Slinger head.

SAND SLINGERS

*3—Beardsley & Piper Stationary Sand Slingers, 16" Head.

CORE OVENS

1—5 Drawer Pull out type gas fired core oven with automatic time shut off drawers 3' x 6'.
1—Gas fired cabinet Core Oven with adjustable shelves, 24" x 30" x 60" high.
1—Coleman Core Oven, gas fired, 4 doors opening into single compartment, 42" wide, 50" high, and 31" deep, adjustable trays on 3" centers.
1—Coleman Core Oven, Gas Fired, 15' x 10' x 8', drawer type.
1—Young (3) Compartment Pull Drawer Oven, FOR MAGNESIUM, each compartment 6'6" wide x 5'9" deep, x 7' high inside, (3) Drawers to compartment. Electric heating for temperature of 800°. FOR HEAT TREATING, DRAWING OR STRESS RELIEVING.

CORE BLOWERS

1—Osborn #91 Core Blower, Serial 10050—F.
2—Osborn #92 Core Blowers, Serial #9703A & 8692-C, Air Clamps.
1—Demmler #3—E Core Blower.
*1—Demmler #2 Core Blower, Air Clamps.
2—Redford Bench Type Core Blowers.

SAND BLASTING EQUIPMENT

1—Sly "Masterbuilt" Mill — three complete with mill barrel 42" inside diameter and 36" deep.
1—Tumbling Barrel 28" diameter, 40" long, equipped with 7 H.P. Motor, Speed Reducer.
*1—Pangborn Rotoblast Rocker Barrel Cleaning Machine, Model #28, type GK-2, cap. 28 cubic feet per charge, with loader and electrical equipment.

LIFT TRUCKS

2—Baker Raulang Electric Fork, 4000 lbs. cap., 119" lift, Used 1 mo. Like New!
1—Automatic Platform Lift Truck, 3000 lbs cap. lift 6', battery operated.
5—Lewis Sheppard 4000 lbs. cap., Jack Lift Trucks, hydraulic, 1950 models, 28" x 40", will take 10", 11" or 12" skid.
1—Ready Power Unit, 6 cylinder, 36 volts.
*1—Automatic 10,000 lbs. platform Low Lift with Ready Power Unit.

SHAKEOUTS

2—Simplicity Shakeouts, 3' x 3', Serial #33—SOS—106, Model S, 1000 lbs. Cap.
1—Simplicity Shakeout, 4' x 6', Model D, 16,000 lbs. cap., 10 H.P. Motor.
1—Simplicity Shakeout, 5' x 7', Serial #57—SOBG—185, Model BG, 5000 lbs. Cap.
1—Simplicity Shakeout, 4' x 6', Serial #46—SOB—145, Model B.
2—Simplicity Shakeouts, 4' x 8', Serial #48—SODE 104, Model DE, 16,000 lbs. cap.
1—Robbins 4' x 10', Floatex Model, Serial F-609, with 7½ H.P. motor & V-belt Drive
1—Robbins Gyrex 4' x 8', 3 deck unit.

AIR HOISTS

7—Ingersoll Rand, Size D, 4000 lbs. cap., complete with low overhead trolley.
2—Ingersoll Rand, Size E, 10,000 lbs. cap., complete with low overhead trolley.
1—Ingersoll Rand, Size C, 2000 lbs. cap., not low head room.
1—Little Giant, Model A, 1000 lbs. cap.
4—Thor Pneumatic, 1000 lbs. cap. low head room.

ELECTRIC HOISTS

1—Shaw Box Load Lifter, 4000 lbs. cap., 440 V, 3 ph, 60 cycle, NEVER USED, LIKE NEW. Serial #H36777, Motor #FM8396.
1—Tramrail, 1000 lbs. cap. with trolley, 220V, 3 phase, 60 cycle.
2—Yale & Towne, 2000 lbs. cap., heavy duty, 220V, 3 phase, 60 cycle, totally enclosed motors, explosion proof, completely rebuilt, 1 with powerized trolley.

TESTING EQUIPMENT

1—Brinnell Hardness Tester—Shore Standard Model D-1, Scleroscope.
1—Gogan Brinnel Testing Machine, 3000 KG, 1945 Machine, Never Used.
1—Riehle Tester, 100,000 cap. Screw type.
1—Riehle Tester, 150,000 cap., Screw type.

LADLES

3—Modern Equipment Model FA Pouring Devices, 36" handwheels.
1—Whiting Ladle 20 tons, tilting, totally enclosed gearing, nose pouring.
1—Whiting Ladle, 2 tons, tilting, totally enclosed gearing, nose pouring.
1—Barrel type Pouring Ladle, 300 lbs. cap.

CONVEYORS—Apron • Roller • Belt

1—12' Powerized Belt Conveyor, 24" belt.
1—18" x 24' Apron Conveyor, Steel Link Belt, complete with motor and drive.
1—24" x 20' Apron Conveyor, Steel Link Belt, —Less motor and drive.
1—Pig Mold Conveyor (Link Belt) 74' long, with drive, for aluminum and magnesium.
*1—Plug Mill, 42" x 96", Link Belt.
80'—24" Above Rail Roller Conveyor, 1½" Rollers, 8" centers, in 10' sections.
2000'—20" ABOVE RAIL CONVEYOR, 2½ ROLLERS ON 3" AND 4" CENTERS. HEAVY DUTY EXCELLENT CONDITION.

BLOWERS

2—Spencer Blowers 5400 CFM, 16 ounce, with 40 H.P. motor.
1—Spencer Turbine Cupola Blower 16 ounce, with 50 H.P. Motor.
*1—North American Turbine Blower, 24 ounce, 1900 C.F.M. with 20 H.P. motor.
*3—Blowers for furnaces, 16 oz., 3 H.P. mtr

SCALES

1—Howe Platform, 6000 lbs. cap. 3' x 4' platform.
*1—Toledo Platform, 6500 lbs. cap.
*1—Car Scale, mfg. Atlas Car & Mfg. Co

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Dear Reader:

Sudden thought: "reader" carries a lot of weight as a title. Most people who merit that designation are the same individuals who stand out whether it be in a business organization or social gathering. The diligent reader is informed, and (more important) finds his thoughts stimulated by what he reads —with the result that often HE is the one who comes up with the ideas that mark him as the superior person he is. It's a pleasure, reader, to spend these few moments with you talking about foundry affairs.

—o—

Foundry Road Map: Several years ago, our market research staff prepared a map of the United States showing the distribution of foundry productive capacity by areas of concentration. Taking our cue from others who had made similar studies for industry in general, we came up with 96 such areas for the entire country. Another FOUNDRY census of the industry has now been completed, and in order of number of employees, the following "first fifteen" areas emerge (in most instances, several surrounding counties are included in an area):

Area	Foundry Employment
1. Chicago	33,666
2. Cleveland	31,741
3. Pittsburgh	28,022
4. Detroit	21,968
5. Milwaukee	19,888
6. Birmingham	18,103
7. St. Louis	17,359
8. Indianapolis	16,791
9. Newark	13,344
10. Los Angeles	12,034
11. Reading	11,480
12. South Bend	10,417
13. Buffalo	9,464
14. Philadelphia	8,945
15. Dayton	8,503

Taking a look at the first fifteen foundry areas ranked in terms of number of foundries rather than employment, we see this lineup:

Area	Number of foundries
1. Los Angeles	332
2. Chicago	270
3. Cleveland	243
4. Pittsburgh	189
5. Newark	185
6. Detroit	155
7. Milwaukee	151
8. New York City	145
9. San Francisco	137
10. St. Louis	115
11. Philadelphia	114
12. Boston	114
13. Indianapolis	106
14. St. Paul	102
15. Cincinnati	94

(Continued on next page)

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Indications are that total annual productive capacity of the foundry industry in the United States approximates 30,000,000 tons based on present melting equipment and facilities operated on normal schedules. Ranking foundry areas by indicated annual melting capacity are:

Area	Annual Capacity (tons)
1. Detroit	2,419,332
2. Chicago	2,094,648
3. Birmingham	1,935,336
4. Pittsburgh	1,899,804
5. Cleveland	1,670,196
6. Indianapolis	1,173,360
7. Milwaukee	1,067,820
8. Saginaw	1,003,836
9. Los Angeles	870,588
10. St. Louis	687,900
11. South Bend	541,440
12. Toledo	505,476
13. Buffalo	498,084
14. Rockford	472,932
15. Davenport	465,936

Elsewhere in this issue, you will find an editorial report containing additional information on FOUNDRY's census study of the industry. We don't think our statistics will help you make better castings or more of them—but they will help you visualize the dynamic character of foundries as a whole and their key position in our economy.

—o—

Norton appoints: The appointments of two advertising men at Norton Co., Worcester, Mass. have been announced by C. Leonard Shaw, Publicity Manager. David B. Tyler (left) has been named to handle advertising of Norton's precision grinding and lapping machines, refractory and boron carbide products. Clifford S. Duxbury, Jr., (right) will direct Norton's export advertising.

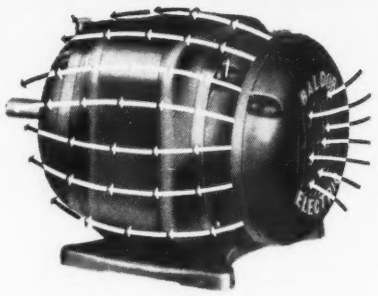
—o—

Artistry in Metal: It has been a pleasure to spend the last several minutes reading a really good foundry sales catalog. We refer to a 38-page bulletin issued by American Car and Foundry Company, 30 Church St., New York 8, N. Y. Aimed at selling their facilities for large production runs, it convincingly pictures and describes ACF facilities.

F. A. Hoffer

Business Manager

FOUNDRIES NEED THIS *Totally enclosed* MOTOR



Arrows indicate the forced air movement over the entire exterior of the BALDOR STREAMCOOLED® motor frame.

The BALDOR STREAMCOOLED® *Motor*

These BALDOR ball-bearing motors are SOLIDLY ENCLOSED, cooled by an outer-mounted fan in the bell-end. They cannot inhale dirt, dust, grit or metal particles. BALDOR STREAMCOOLED Motors require no dismantling for cleaning. Thus less servicing—no interruption of production. Let us tell you more about these long service life BALDOR Motors (which are sold and serviced in more than 300 Trade Centers).

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Baldor

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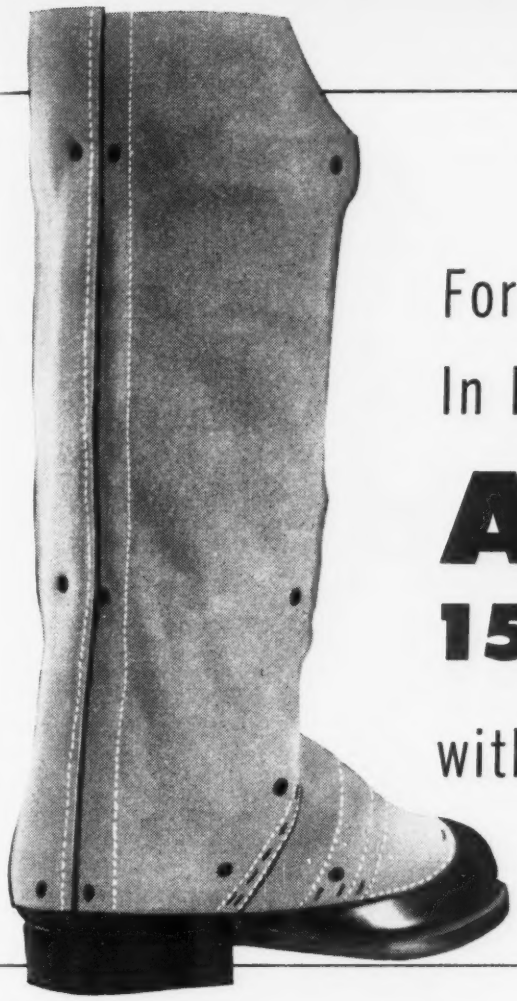


Protective Clothing

For Lower Costs In Leg Protection . . .

AO's NEW 1512R LEGGING

with Removable, Re-usable Frame

Something new has been added to AO's standard spring steel 1512 Legging in this companion model . . . *replaceability* of either frame or fabric. This feature means lower costs in leg protection two ways:

1. If the covering is torn or burned, a complete new unit is not necessary. Just order a new covering.

2. Should a spring become broken, keep the covering and order a new frame.

Instead of being sewn to the frame, the covering is attached by snap fasteners. No adjustments are necessary. Fits securely at ankle and instep. Air space between legging and leg helps insulate for comfort. AO's 1512R Legging is easy to put on . . . easy to remove. Your nearest AO Safety Products Representative can supply you.

Available in chrome-tanned *cowhide* as the 1512R-CL, in *asbestos* as the 1481R-A, in *flame-resistant duck* as the 1482R-FR.

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

A 3" POT FOR BRASS...
and this 6-Ton Bottom Pour for Steel..

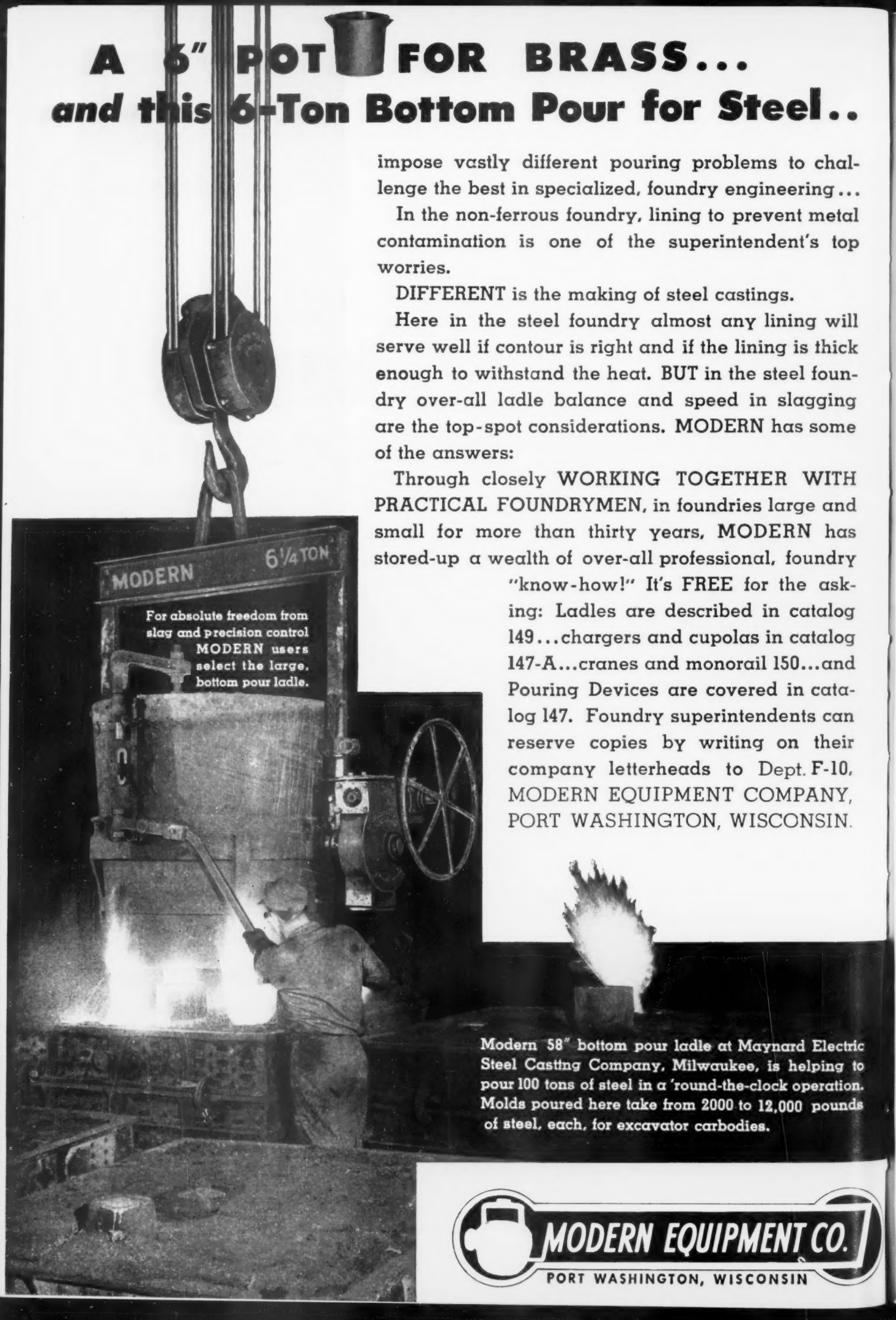
impose vastly different pouring problems to challenge the best in specialized, foundry engineering...

In the non-ferrous foundry, lining to prevent metal contamination is one of the superintendent's top worries.

DIFFERENT is the making of steel castings.

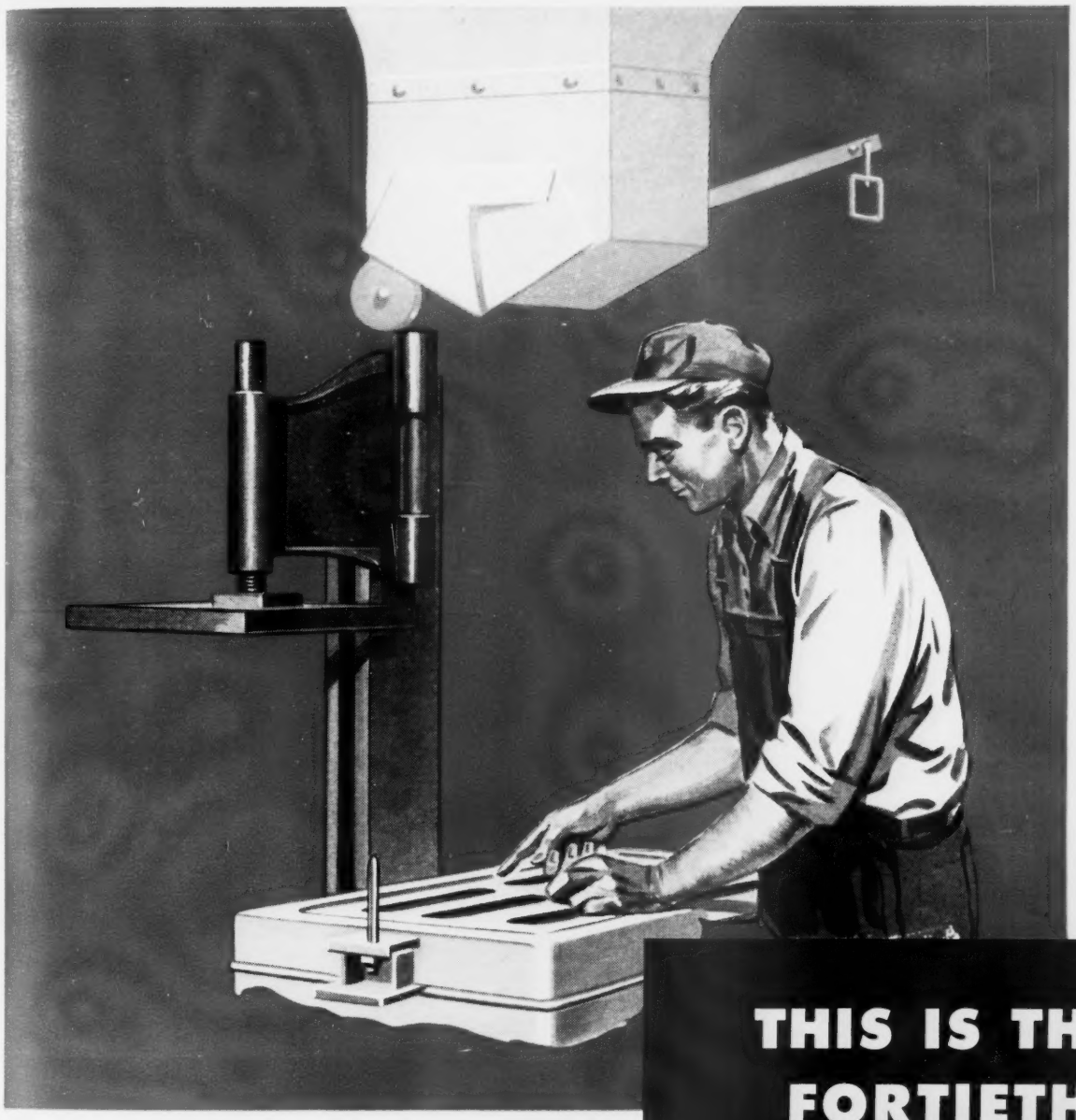
Here in the steel foundry almost any lining will serve well if contour is right and if the lining is thick enough to withstand the heat. BUT in the steel foundry over-all ladle balance and speed in slagging are the top-spot considerations. MODERN has some of the answers:

Through closely WORKING TOGETHER WITH PRACTICAL FOUNDRYMEN, in foundries large and small for more than thirty years, MODERN has stored-up a wealth of over-all professional, foundry "know-how!" It's FREE for the asking: Ladles are described in catalog 149...chargers and cupolas in catalog 147-A...cranes and monorail 150...and Pouring Devices are covered in catalog 147. Foundry superintendents can reserve copies by writing on their company letterheads to Dept. F-10, MODERN EQUIPMENT COMPANY, PORT WASHINGTON, WISCONSIN.



Modern 58" bottom pour ladle at Maynard Electric Steel Casting Company, Milwaukee, is helping to pour 100 tons of steel in a 'round-the-clock operation. Molds poured here take from 2000 to 12,000 pounds of steel, each, for excavator carbodies.

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN



THIS IS THE FORTIETH MOLD . . .

from one application of

STEVENS LIQUID PARTING

That's normal experience in a large Midwest foundry that averages 1200 tons of castings per month. They use Stevens Liquid Parting for all of their molding operations. Here's why:

- Stevens Liquid Parting gives up to 60 molds from one application.
- Patterns are left clean, with no adhering sand.
- Molders save time . . . increase production with each mold because they do not have to shake parting on the patterns each time.
- Molds always give smooth castings since sand separates cleanly.

Stevens Liquid Parting can be the answer to your molding problems. Why don't you try Stevens Liquid Parting?

Write for a sample – or call your Stevens representative today.

FREDERIC B.
STEVENS
INCORPORATED
EVERYTHING FOR A FOUNDRY
DETROIT 16, MICHIGAN

OFFICES: DETROIT • BUFFALO • CHICAGO • CLEVELAND • NEW HAVEN • INDIANAPOLIS
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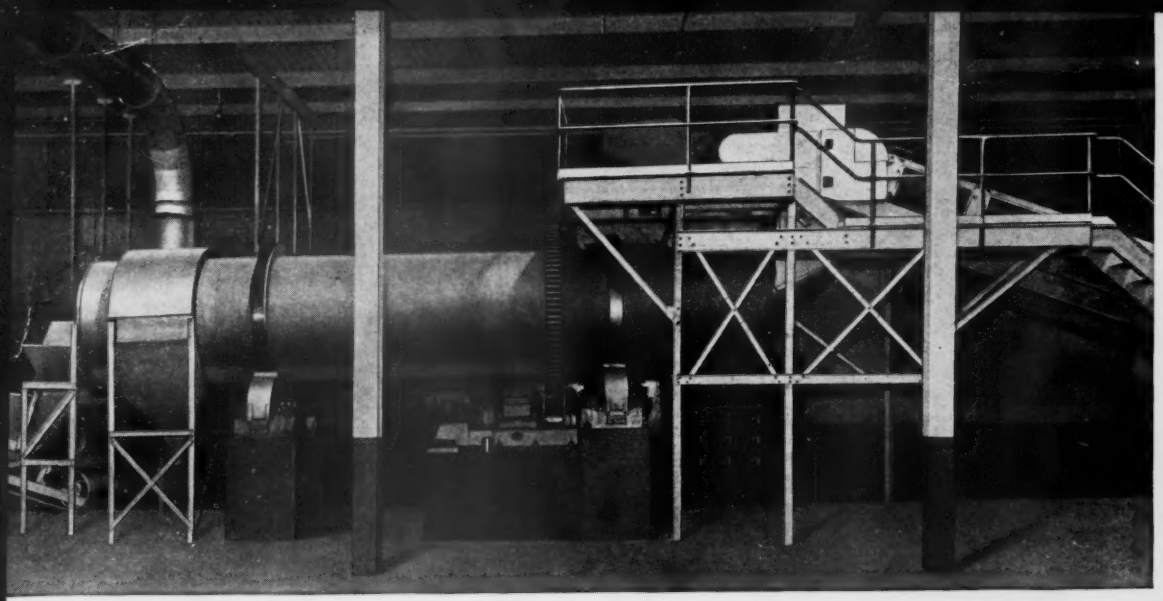
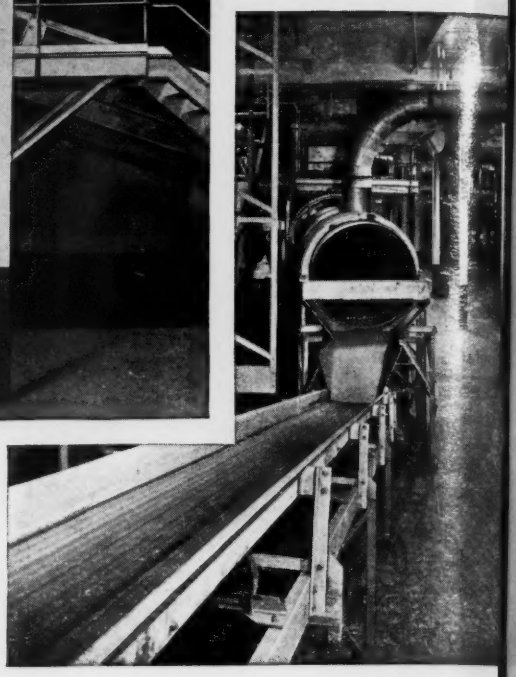


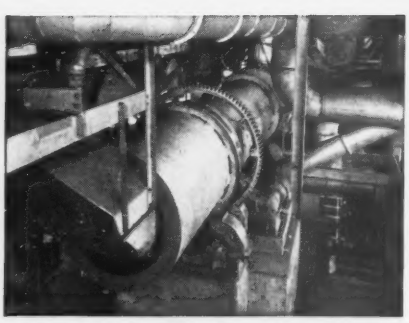


Above: Side View of Continuous Sprue Mill Showing Inclined Apron Feeder and Belt Conveyor Handling Cleaned Sprue to Yard Storage. *At the right:* Discharge End of Soft Iron Sprue Mill.

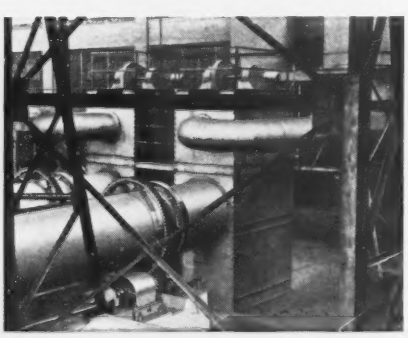
Our customers report that installing . . .

Sprue Mills

. . . pays big Dividends



Feed End of Hard Iron Sprue Mill in Knockout House of Large Automotive Foundry.



Sprue Cleaning Mill Mounted Outside in Yard of Large Automobile Foundry.

"Direct Savings Associated With Sprue Cleaning Paid for the Installation in Less Than 6 Months"

● Charging cleaned sprue into a cupola reduces the stone additives in some cases from 4% to less than 1½%, resulting in less coke consumption — faster melting — less slag to handle — reduced deteriorization to cupola linings. Cores from the knockout can be processed with the sprue to break lumps. This makes handling and disposal of waste sand easier and releases rods, gaggers and arbors for picking. Let us show you how profitable a completely mechanized sprue cleaning and waste sand handling installation can be.

DESIGNERS · ENGINEERS

BARTLETT-SNOW
CLEVELAND 5, OHIO

FABRICATORS · ERECTORS

Foundrymen Who Know — Buy Bartlett-Snow